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VOLUME XXIX, PART I PRICE FIVE SHILLINGS

1954

PROCEEDINGS

OF THE

Bristol Naturalists' Society

EDITED BY SCOTT SIMPSON
ASSISTED BY A COMMITTEE

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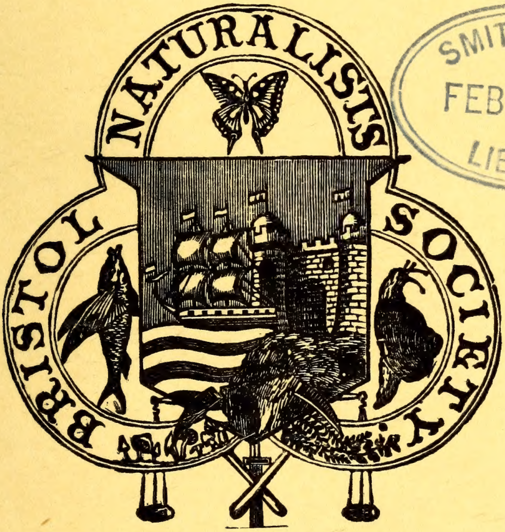

"Rerum cognocere causas."—Virgil

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AT THE BURLEIGH PRESS, BRISTOL

Issued August 25*th*, 1955

All matter for inclusion in the next issue of the *Proceedings* should be sent to :—

DR. SCOTT SIMPSON,
THE UNIVERSITY,
BRISTOL, 8

NOT LATER THAN FEB. 28.

Other instructions for authors appear on Contents page.

All Books, Pamphlets, Reports of Proceedings sent by way of exchange, gift or otherwise, and all correspondence relating thereto and to purchases of the Society's publications should be addressed to :—

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MISS I. M. JAGO, B.Sc.,
51 WESTBURY ROAD,
BRISTOL

All other communications should be addressed to the Hon. Secretary :—

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Weekdays - - - -	10.0 a.m. to 6.0 p.m.
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2. To ensure consideration for inclusion in the next issue, contributions must be received not later than February 28.
3. All copy must be type-written (preferably double-spaced) or in very clear manuscript and, in either case, with good margins.
4. Copy submitted is not returnable and authors are advised to keep a duplicate,
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JAN 26 1956

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1954

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NEW MEMBERS

From March 1, 1954, to May 1, 1955

A = Associate Member. *C* = Country Member.

C.	Angles, R. A., A.M.I.Mash.E., A.F.R.A. and S.	3 Grove Mansions, Queen's Road, Weston-super-Mare, Som.
A.	Archard, K. F.	15 Nibley Road, Shirehampton, Bristol.
	Balch, Miss P. M.	580 Wells Road, Knowle, Bristol.
	Barefoot, Mrs. V. G.	7 Holland House, South Road, Weston-super-Mare, Som.
	Bennett, Miss A. E., B.Sc.	17 Caledonia Place, Clifton, Bristol, 8.
	Bowen, Miss A.	Tudor Cottage, Redland Hill, Bristol, 6.
	Bright, F. G.	73 Bryants Hill, St. George, Bristol, 5.
	Bright, Mrs. F. G.	Do.
	Brooke, Mrs. B. K.	" Ambrea ", Staunton Lane, Whitchurch, Bristol, 4.
A.	Camden, R. J.	668 Portway, Avonmouth, Bristol.
	Carlton, Miss L., M.A.	6 Frederick Place, Bristol, 8.
	Challenger, S., B.Sc., F.L.S., N.D.H.	Horticultural Science Labors., Leigh Woods, Bristol, 8.
	Challenger, Mrs. S.	Do.
	Chatterton, Miss B.	19 Richmond Terrace, Clifton, Bristol, 8.
	Chatterton, Mrs. I. E.	37 Greystone Gardens, Westbury-on-Trym, Bristol, 9.
	Clay, S., M.A., Ph.D.	Merlin, Cadbury Lane, Clapton-in-Gordano, Bristol.
	Clay, Mrs.	Do.
	Clement, Mrs. E. S.	2 Effingham Road, St. Andrews, Bristol, 6.
A.	Clements, Miss E. M.	149 Queens Road, Bishopsworth, Bristol, 3.
A.	Collins, Miss M. A.	22 Park Road, Shirehampton, Bristol.
A.	Cook, Miss S.	9 Blenheim Road, Redland, Bristol, 6.
	Cowley, L. G.	37 Avon Park, Redfield, Bristol, 5.
	Cowls, Miss R.	37 Cornwallis Crescent, Clifton, Bristol, 8.
	Davey, Miss E. D.	16 West Dene, Stoke Bishop, Bristol, 9.
	Davies, Miss E.	54 Wellington Walk, Westbury-on-Trym, Bristol, 9.
	Davis, Miss J. E.	40 Churchways Avenue, Bristol, 7.
C.	Dawe, Miss L. M.	School House, Tickenham, Clevedon, Som.
	Dennison, V. D., B.Sc.(Econ.)	12 Newlyn Avenue, Bristol, 9.
	Evans, S. D. P.	17 Mortimer Road, Filton, Bristol, 7.
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	Flook, Miss D. K.	23 The Park, Kingswood, Bristol.
A.	Fry, C. H.	Sidcot School, Winscombe, Som.

	Gale, Miss S. M.	Chew Hill House, Chew Magna, nr. Bristol.
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A.	Hickman, R.	57 Westbury Road, Westbury-on-Trym, Bristol, 9.
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A.	Howell, M.	101 Belmont Road, St. Andrews, Bristol, 6
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	Mogford, E. H.	3A Southfield Road, Westbury-on-Trym, Bristol, 9
	Morgan, H.	Dodmore Crossing, Westerleigh, nr. Bristol.
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	Pryce, J. A.	141 Cromwell Road, St. Andrews, Bristol, 6
	Quick, Mrs. O. E., B.Sc.	129 Stoke Lane, Westbury-on-Trym, Bristol, 9.
	Quick, M. C.	Do.

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	Rosling, Mrs. H. N.	Do.
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	Wilson, Mrs. M. L.	Stuart House, Royal Fort, Bristol, 6
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	Wostenholm, Miss M.	2 Lower Hanham Road, Hanham, Bristol.
	Yemm, Mrs. M., B.A.	Stoneleigh, Long Ashton, nr. Bristol.

AFFILIATED SOCIETIES

Bath Natural History Society, 8 Pulteney Street, Bath.

St. Ursula's High School Natural History Society, Brecon Road, Westbury-on-Trym, Bristol, 9.

REPORT OF COUNCIL

1954

THE Membership of the Society at the end of the year was 413 including 10 Affiliated Societies.

At the Annual General Meeting the officers and members of Council were duly elected with Mr. Harry Savory as President in place of the retiring President, Professor W. F. Whittard. Mr. H. W. Turner was elected an Honorary Member in appreciation of his services to the Society which included editing the " Proceedings " for over 19 years.

A programme arranged by Mr. J. W. Cowie in connection with the visit of the South Western Naturalists' Union to Bristol was approved by Council. The arrangements included a reception given by the Lord Mayor.

It was decided that no General Exhibition should be held in 1954 but that four General Meetings would be arranged before Christmas.

A formal invitation was extended to the Society of British Entomology in connection with their proposed Congress in Bristol in 1955.

The Society learned of the award of C.B.E. to Professor C. M. Yonge of Glasgow University with much satisfaction.

The deaths of Sir Lewis Fermor, a Past President of the Society, Mr. and Mrs. H. F. Barke and Mr. G. S. Maunder were noted with regret.

C. S. CARLILE, *Hon. Secretary*

HON. LIBRARIAN'S REPORT

1954

DURING the year 1954 the B.N.S. Library was used extensievly. 327 books were borrowed by a wide range of members, and over a wide range of subjects. Thirteen new books were bought and 11 were presented. Our thanks have been tendered to the donors. Two new Journals have been acquired, one German, and one from Australasia. A large number of loose copies of periodicals have been bound, and a small number of ' out of condition ' and valuable journals have been rebound. It is hoped that by the end of 1955 all binding of periodicals will be completed except for the current numbers. Then the Hon. Librarian will proceed with the replacement of certain missing numbers of important Journals. We are most grateful to Dr. Wallis for providing 12 much needed new bookshelves. It is hoped that in 1955 we shall be able to overhaul the Catalogue. When all this work has been completed we should have a first class library, and its maintenance should then be a relatively simple matter.

J. H. DAVIE, *Hon. Librarian*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

RECEIPTS AND PAYMENTS FOR THE YEAR ENDING 31 DECEMBER, 1954

Dr.

1953 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	To Members' Subscriptions :—				
	Full Members	1953	2 0 0		
		1954	222 12 6		
		1955	6 10 0		
221 12 6				231 2 6	
	,, ,, of the same household	1954	23 5 0		
		1955	1 10 0		
24 0 0				24 15 0	
	Country members	1954	27 3 0		
		1955	3 0 0		
35 8 0				30 3 0	
	" Old " Associates	1954	4 7 0		
		1955	6 6		
5 16 6				4 13 6	
	" New " Associates	1953	1 0 0		
		1954	8 12 6		
		1955	7 6		
6 7 6				10 0 0	
9 10 0	Affiliated Societies	1954		10 0 0	
302 14 6					310 14 0
8 3 0	,, Separates and Covers, *Proceedings*, 1953 ...				3 1 6
8 2 8	,, Sale of Publications				8 10 0
7 6	,, Sale of Bird List				2 6
8 6	,, Profit on Dinner				1 15 6
12 9	,, Field Committee : Surplus over Expenses ...				— — —
6 14 5	,, Interest on Deposit in Post Office Savings Bank				8 2 1
327 3 4					332 5 7
352 0 10	,, Balances from last Account				776 6 2
— — —	,, Sale of Geological Survey of India (ex Library) ...				85 0 0
450 0 0	,, Sale of Zoological Record (ex Library) ...				— — —
1,129 4 2					£1,193 11 9

A. H. PEACH, *Hon. Treasurer*,
18 January, 1955.

Cr.

1953 £ s. d.		£ s. d.	£ s. d.
	By Subscriptions :—		
1 1 0	Ray Society	1 1 0	
2 0 0	S.W. Naturalists' Union	2 0 0	
			3 1 0
158 16 5	,, *Proceedings* (1953)		155 18 6
	,, Stationery	24 7 2	
56 12 5	,, Printing	9 18 10	
			34 6 0
	,, Postages, etc. :—		
	Hon. Secretaries	29 19 10	
	Hon. Treasurer	4 9 7	
	Hon. Editor	5 0	
	Hon. Librarian	13 2	
34 3 0	,, ,, Carriage	6 3	
			35 13 10
3 15 0	,, Fire Insurance (Library)		3 15 0
10 10 6	,, Books and Periodicals		14 1 0
1 0	,, Rent (use of Library Room)		1 0
9 0	,, Bank Charges		8 0
8 2 2	,, Fares and Expenses of Meetings		9 9 9
6 0 0	,, Clerical Assistance (issue of Circulars, etc.)		6 0 0
	,, Field Committee : Deficit on Expenses ...		2 0 11
25 18 9	,, Book-binding		68 1 9
	,, Grants to Sections :—		
10 0 0	Botanical	— — —	
5 8 9	Entomological	3 5 0	
15 0 0	Geological	15 0 0	
15 0 0	Ornithological	25 0 0	
			43 5 0
	,, Rent : Steep Holm		4 10 0
	,, Grant to Mid-Somerset Naturalist Society for Bird Rest on Flatholm Lighthouse		5 5 0
			385 16 9
352 18 0			
	,, Balances to next Account :—		
116 1 5	Cash at Bank	65 9 11	
645 6 10	Deposit in Post Office Savings Bank ...	728 9 2	
14 17 11	Cash in hands of Hon. Secretaries ...	13 15 11	
			807 15 0
1,129 4 2			£1,193 11 9

Audited and found correct,
F. W. EVENS, *Hon. Auditor.*
Bristol, 25 January, 1955.

REPORT OF BOTANICAL SECTION
1954

THE meetings arranged for the Autumn and Winter Session were well attended, but the indoor Spring and Summer meetings have not attracted many members. The Annual Business Meeting was held in January and the following officers were elected : President, Prof. Macgregor Skene ; Chairman, Mr. F. W. Evens ; Hon. Secretary, Mrs. M. L. Davis ; Assistant Hon. Sectetary, Mr. W. H. Hale ; Committee Members : Miss D. Shaw, Mrs. G. S. Wakefield, Dr. A. F. Devonshire, Mr. I. W. Evans, with the Chairman and Hon. Secretaries as members ex officio. After the business part of the meeting Mr. I. W. Evans described a visit he had made the previous summer to the Forres district of Moray in company with members of the Botanical Society of the British Isles, exhibiting some remarkable photographs of some of the rarer plants seen, and herbarium specimens of others.

At the February meeting Mr. Peter Bell gave his experiences of a Botanical expedition to the tropics of the New World, illustrating his talk with colour slides.

Mr. C. E. Hubbard was unable to come in March to lecture on the structure and classification of British grasses, and Mr. I. W. Evans brought a comprehensive collection of British and Alien species from his Herbarium and described the construction of the different families. To conclude the meeting the Secretary showed some colour transparencies of Alpine plants. The October meeting consisted of a series of short Papers by members of the Section :—

Miss D. Shaw—A walk from Clevedon to Portishead.

Mrs. D. Bunce—Pollen loads of the honey bee (a brief description of the book by D. Hodges).

Dr. A. F. Devonshire—A holiday at Perth.

Mr. C. H. Cummins—Some plants of S. Cornwall.

Mr. I. W. Evans—A description of some interesting local plants, and others, from his Herbarium.

The talk arranged for November was cancelled by the proposed speaker and the Section was indebted to Mr. I. W. Evans for coming forward at short notice on a second occasion to fill the gap, this time with some Botanical Recollections.

At the last meeting of the year the Forestry Commission film—The Culbin Story—was shown, followed by a documentary film concerning the New Forest.

During the spring and summer a number of field walks were arranged and led by members as follows :—

April—Whitchurch to Keynsham and Compton Dando. Mr. I. W. Evans.

May—Bath and Bathford. Mr. I. W. Evans.

June—Churchill and Lower Mendip. Mr. W. H. Hale.

July—Alveston to Tockington. Mrs. G. S. Wakefield.

„ —Hanham and R. Avon. Mr. I. W. Evans.

Aug.—Clevedon to Portishead. Miss D. Shaw.

Sept.—Lansdown, nr. Bath. Dr. A. F. Devonshire.

The University Botanic Garden was visited during the summer, also the gardens at the Royal Fort.

The Section has agreed to help the Botanical Society of the British Isles in their task of compiling distribution maps of the British Flora. Dr. A. F. Devonshire is in charge of this work for the section.

We regret to report the death of Major J. G. MacGeorge, who, until recently, was a member of our section and a keen recorder of plants.

M. L. DAVIS, *Hon. Secretary*

REPORT OF ENTOMOLOGICAL SECTION

1954

THE 90th Annual General Meeting of the Section was held on January 4, Mr. N. A. Watkins, M.A., F.R.E.S., was elected President, and Mr. C. L. Bell, F.R.E.S., Secretary. Mr. A. H. Peach and Mr. C. S. H. Blathwayt, M.A., F.R.E.S., the retiring President and Secretary, did not stand for re-election The retiring President then gave a most interesting talk on " Reminiscences of 40 years collecting" and a discussion followed.

Apart from the above Meeting 4 ordinary meetings were held during the year as follows :

Feb. 1. Mr. R. Henderson : " Mimicry in exotic butterflies."

Mar. 2. Dr. F. S. Wallis, PhD., D.Sc., F.G.S. : " Insects of early ages."

Oct. 5. Short talks by members on the year's collecting.

Nov. 1. Several members exhibited interesting specimens caught during the year. The following notes have been supplied by Mr. I. R. P. Heslop on his exhibit at this meeting.

1. *Apatura iris.* Linn (Purple Emperor)

   Specimens all taken in 1954 as follows :—

   Male bred on July 10 from a larva collected by the exhibitor in Sussex on May 17.

   Male caught by the exhibitor in Wilts on July 22. This specimen came in at the window of exhibitor's car and was secured with a killing bottle.

   Male caught by exhibitor in Wilts July 22.

   Male caught by Mrs. E. A. Heslop in Wilts July 27.

   Four cards illustrating the life history of the bred specimen. The horns of the larva were remarkably asymmetrical, as could be seen from the preserved cast larval skin mounted on one of the cards.

2. *Limenitis camilla* Linn. (White Admiral)

   An extreme example of ab nigrina Weym, caught by Mrs. E. A. Heslop in Somerset July 4, 1925.

3. *Aphantopus hyperanthus* Linn. (Common Ringlet)

   An ab. *lanceolata* Shipp, caught by exhibitor in Wilts on August 16, 1954.

4. *Thecla betulae* Linn. (Brown Hairstreak)

   Two sets of six specimens (three male and three female) bred by the exhibitor. One set from Somerset (1954) and the other from Huntingdonshire (1927). The specimens selected from long series from each county showed the range of variation in size and colouration.

   The size of the Somerset specimens range from three to four millimetres more than that of the Hunts ones in the male and from five to six millimetres more in the female. Both series represented were reared on Plum.

CECIL L. BELL, *Hon. Secretary*

REPORT OF GEOLOGICAL SECTION

1954

AT the Annual Business Meeting, which was held on January 19, the following Officers were elected : Mr. H. Homeshaw, President ; Dr. F. Coles Phillips, Vice-President ; Dr. I. S. Loupekine, Hon. Secretary ; Dr. D. T. Donovan, Recorder. Mr. T. R. Fry, Dr. A. Marsden, Mrs. M. M. Perkins, Mr. F. Stenhouse Ross, Mr. H. S. Shinner, Dr. Scott Simpson, Dr. Stanley Smith, Mr. H. W. Turner, Mrs. G. S. Wakefield, Dr. F. S. Wallis and Professor W. F. Whittard were appointed Committee Members. The formal business was followed by an Exhibition of Members' collections and displays contributed by the City Museum and the University which was held at the City Museum (by kind permission of the Director). The more notable exhibits were as follows :—

City Museum : Selected ammonites from the Tutcher Collection.

Geology Department : X-ray radiography of fossils.

Geological Section (arranged by Mr. F. J. Holwill) : Minerals, rocks and fossils collected at the Summer Field Meetings, 1953.

Geological Section : Fossils, books and photographs from Miss Theodora Shaw's Collection.

Mr. F. S. Clements : Recent temporary exposure of Middle Lias at Dundry.

Mr. E. H. Day : Pyrite vein in coal from Radstock.

Mr. B. Frost : Fossils and minerals.

Mr. T. R. Fry : Fossils from the Avonian of the Bristol District.

Mr. R. Goldring : Geological maps of N. Devon and W. Somerset.

Mr. H. Homeshaw : Pre-Cambrian rocks from North Wales.

Dr. I. S. Loupekine : Specimens and photographs illustrating the desert phenomena of (i) Western Sahara, Algeria, (ii) Libyan and Western Deserts, Egypt (collected 1952).

Dr. F. Coles Phillips : Rocks collected in Australia, 1953 (including uranium ore from Radium Hill under test by radioactivity detector set up by Mr. I. H. Ford).

Mr. F. Stenhouse Ross : Ammonites from the Lower and Upper Jurassic, first collected in 1936.

Mrs. G. S. Wakefield : Minerals from the Trelease Collection.

Mr. A. G. Wright : Glacial erratics and Norwich Crag specimens from Norfolk.

On February 18 Dr. D. T. Donovan gave an illustrated account of " A Geological Journey to Italy ", in which he described the expedition which took place in July–August, 1954, with the purpose of collecting fossils from the Lias formation in order to effect a comparison with North European developments.

On March 16 Mr. R. D. Russell (National Agricultural Advisory Service) introduced an entertaining coloured sound-film entitled " The Formation of Soils " and, by means of Kodachrome transparencies, gave a general account of soils with special reference to the geological formations of the West of England.

Six field-meetings were held during the Summer. On April 14 the Section visited the Harry Stoke Coal Mine under the guidance of the Manager, Mr.

W. D. Lytham. On May 8 a day was spent on the Malvern Hills where Pre-Cambrian and Lower Palaeozoic rocks were examined under the leadership of Professor W. F. Whittard. On June 9 Mr. T. R. Fry led an evening excursion to Dyrham and Horton where collecting was carried out from the Inferior Oolite and Fuller's Earth formations. On July 10 the Section visited the Bratton and Westbury districts, Wilts., where, under the guidance of Mr. H. W. Turner, Upper Jurassic and Cretaceous formations were seen. On August 11 an evening meeting was held on Messrs. Lewis' site in the Horsfair where excavations in the Trias were inspected and the engineering problems kindly explained by members of the City Engineer's Department. Finally, on September 11 a joint meeting with the University of Bristol Tutorial Class in Geology took place when Dr. F. S. Wallis guided a coach party to examine the old manganese and iron workings at Higher Pitts Farm, the geology and scenery of Ebbor Rocks and the cave at Wookey Hole.

On October 21 Mr. S. W. F. Patching (Atomic Energy Research Establishment) delivered a lecture on " Geology and Nuclear Energy " in which he reviewed the applications of atomic power to industrial and civilian purposes and described the occurrence of uranium-bearing deposits, the prospecting methods that are used in their discovery and the subsequent treatment and handling of the ores.

On November 16 Dr. F. Coles Phillips gave an illustrated account of "A Geological Tour of Australia " in which he described some of the more striking geological features of the Continent which he visited in 1953 at the invitation of the Australian universities.

It is with the deepest regret that the Section records the deaths of the President, Mr. H. Homeshaw, and of Mr. H. F. Barke, Mrs. E. W. Barke, Mr. B. F. Brueton, Sir Lewis Fermor, Mr. G. S. Maunder and Mr. E. L. Smith.

I. S. LOUPEKINE, *Hon. Secretary*

REPORT OF ORNITHOLOGICAL SECTION
1954

"THE WREN
THE WREN
THE KING OF
ALL BIRDS . . ."

AT the 31st Annual Business Meeting on January 22 Mr. H. H. Davis, the Hon. Secretary since 1937, was elected President in succession to Mr. A. C. Leach who had completed his full term of office; Mr. P. J. Chadwick was elected Hon. Secretary, Mr. G. E. Clothier Assistant Hon. Secretary, and Mrs. J. Lance and Mr. P. F. Bird were elected to serve on the General Committee. At a subsequent meeting Mrs. M. Taylor and Mr. B. King were co-opted.

Seven other meetings, listed below, were held during the winter and autumn months and were well supported, the average attendance being 93.

Feb.	17.	Mr. W. Higham: Birds of the Scottish Highlands.
Mar.	19.	Mr. P. E. Brown: The breeding cycle of the Marsh Warbler.
Apr.	2.	Summer Field-programme Meeting.
Sept.	29.	Exhibits and communications by Members.
Oct.	22.	Mr. H. Savory: The art of George E. Lodge—sportsman and naturalist.
Nov.	17.	Dr. N. Tinbergen: Field studies of the behaviour of Gulls.
Dec.	10.	Mr. R. M. Lockley: Gannets, Puffins and Atlantic Seals.

Field work organised by the Committee was also well supported and included sample Buzzard Surveys in South Gloucestershire and North Somerset, a Wood Warbler Distribution Enquiry covering 55 sq. miles of South-West Gloucestershire, a census of Heronries and the compilation of Roost and Nest Record cards (278) on behalf of the British Trust for Ornithology, and Diurnal Migration Watches in October and November in conjunction with the Mid-Somerset Naturalists' and Dursley and District Bird Watching and Preservation Societies on behalf of the British Naturalists' Association.

Other activities carried out by members included the ringing of 2,362 birds, and 20 members assisted with the duck counting programme arranged by Mr. King, the regional organiser for Somerset, as part of the International Wildfowl Enquiry.

Three evening field-walks were arranged: two on May 13 at Saltford and Leigh Woods were attended by 25 and 30 members respecttively, but at the third on May 28 over Barrow Hill and Bourton Combe, the attendance was adversely affected by inclement weather and only 6 members participated.

Twenty-one members took part in an all-day excursion on May 16 to Stanway in the N. Cotswolds, where the party was met and taken on a conducted tour by the Hon. Guy Charteris.

The membership at the close of the year totalled 145.

P. J. CHADWICK, *Hon. Secretary*

ACCOUNT OF THE GENERAL MEETINGS

1954

THE 91st Annual General Meeting was held on January 14th, when the election of Officers and Council for the ensuing year took place. The retiring President, Professor W. F. Whittard, gave his Presidential address entitled " Rare Fossils ", during the course of which many slides were shown. The process of fossilisation was explained and it was pointed out that under certain conditions even the soft parts of animals have persisted as carbonaceous films. The origin of these and other unusual fossils was explained. At this Meeting Mr. Harry Savory was unanimously elected as President.

At the General Meeting on February 4th, Dr. H. W. Miles, Professor of Entomology at Wye College, gave a talk of much local interest on " Some Insects of a Somerset Garden ", during which attention was drawn to the effect of climate and vegetation on insect life.

During October two General Meetings were held, as it had been decided that there should be no Exhibition. The first of these meetings was held on October 7th when Mr. K. Brown, the Fishery Officer of the Bristol Water Works Company, introduced his film, " Blagdon Trout", and Mr. K. Roberts, the Resident Engineer of the Chew Valley Lake, gave a talk on the history of its development. The second October General Meeting, held on the 28th, was the occasion of the visit of Dr. A. T. Dollar of Birkbeck College, London, who gave an illustrated lecture on Lundy in which he dealt with the Geological, Archaeological and Historical aspects of the island.

On November 18th at the General Meeting the speaker was Professor R, Milnes Walker, whose interesting talk, "Mammals and Birds of East Africa". was illustrated by two excellent films and slides in colour.

At the last General Meeting of the Year on December 9th, the visiting lecturer was Mr. Peter Scott who introduced his film " The High Andes ", which dealt with bird life on Lake Titicaca and a tributary of the Amazon. Mr. Scott commented on the journey which he had made and the rare birds he had seen, especially the beautiful Torrent Duck in Bolivia. The lecturer contributed still further to the success of the Meeting by his remarkable sketches.

Throughout the year, the attendance at General Meetings ranged from 22 to 265 with an average of 89. General Field Meetings were held during the Summer.

C. S. CARLILE, *Hon. Secretary*

FIELD MEETINGS

Date	*District*	*Leaders*
24 April	Hillesley, Hawkesbury and Horton	Dr. A. F. Devonshire
22 May	A Mendip Tour	Mr. T. H. Payne
19 June	Sand Bay and Goblin Combe	Mrs. R. Millard Miss B. Cooper Mrs. M. M. Perkins
17 July	Brean Down	Mr. Ivor Evans
7 August	Vale of Pewsey	Mr. R. S. Barrow Mr. Goldstraw Mr. Ivor Evans
4 Sept.	Steep Holm also Iron Acton, Tortworth and Damery	Miss M. E. Habgood Dr. M. L. K. Curtis

In April a visit was made to localities in the adjacent parishes of Hawkesbury and Horton on the Cotswold escarpment. In the afternoon, members walked from Starveall to Kilcot Woods, and thence to the tumulus known as Nan Tow's Tump. Later the Church at Hawkesbury and an Iron Age Camp at Horton were inspected. The most interesting plants seen were *Helleborus viridis*, growing abundantly at Kilcot, *Draba muralis* by Hawkesbury church and *Trachystemon orientale* at Horton.

The May meeting was a whole day spent in the Mendips. On the outward journey members went to see Compton Martin church, the history of which was told in a short talk by the Rev. A. Stevens. Then followed a walk through Ubley woods to Nordrach. *Paris quadrifolia* and *Listera ovata* were found as well as many other interesting botanical specimens. At Priddy the swallet known as St. Swildon's hole was seen and an exposure of Millstone Grit examined where the Ebbor road was being widened. Next the Fairy quarries and Edford wood were explored. Members heard the woodlark and night jars and found large beds of *Geum rivale*, also specimens of *Ranunculus lingua*, *Aconitum napellus*, *Polygonatum multiflorum* and *Mimulus guttatus*.

The June meeting was held at Sandpoint and in the evening there was a walk through Goblin Combe. Among the birds seen were oyster catchers, shelduck, a raven, a kestrel, wheatears and rock pipits. The most interesting plants found were *Trinia glauca*, *Onopordon acanthium*, *Cynoglossum officinale*, *Rucus aculeatus*. Geologists visited the raised beach and examined the outcrop of volcanic rock which occurs there. A further outcrop was examined at Goblin Combe.

In July, all arrangements were made for an expedition to Steep Holm, which unfortunately had to be cancelled owing to bad weather and members went to Brean Down instead. Sea coast flora was examined and amongst other plants, the rare grass *Kocleria vallesiana* and the local milk thistle, *Cardus marianus*, were found.

A whole day joint Field meeting with about 30 members of the Bath Natural History Society was held on August 7th. In the morning the Bristol Naturalists went to Polechurch Common and studied aquatic plant associations. A large patch of the small Fleabane, *Inula pulicaria*, was seen.

The two parties from each Society met at Seend, five miles west of Devizes, on a hill rising to 400 feet on an outlier of Lower Greensand which rests on Jurassic Kimmeridge clay and Corallian. An old quarry in the Corallian was inspected before lunch and afterwards the two coaches made their way across the wide end of Pewsey Vale. As it was raining heavily a visit to Edington Church was made and later Salisbury plain was crossed at Tinhead. After looking at a large exposure of Upper Greensand, a suitable place was chosen in which to study chalk flora. Here among other plants of interest, *Thesium humifusum* was seen. Then followed a walk to a view point of Pewsey Vale where Mr. Barron pointed out all the geological features of the landscape.

In September two separate meetings were held on the same day ; one on Steep Holm and one to the Tortworth area. Birds seen on the island that day were robin, hedge sparrow, wren, blackbird, song thrush, cormorant, swallow, house marten, wheatear, peregrine, kestrel, rock pipit, willow warbler, grey wagtail, whitethroat, herring gull, lesser black-backed gull, great black-backed gull, curlew and raven. Plants recorded by the Botanists were *Lycopsis arvensis, Hyoscyamus niger, Anagallis arvensis, Calamintha officinalis*. Meanwhile those who went with Dr. Curtis examined quartz-coglomerates belonging to the Upper Old Red Sandstone at Brook Farm near Falfield. After tea members went via Woodford to Damery ; here they saw basaltic lavas of the Silurian age in the large Damery quarry and collected fossils from the Llandovery sandstones near Damery Bridge. Then a visit to Tortworth Park was made and the trees in Tortworth Court studied. Finally came a walk along the lakeside to Cromhall noting exposures in Chrboniferous limestone on the way.

I. M. JAGO, *Hon. Field Secretary*

OBITUARIES

H. F. Barke

HERBERT Frederick Barke died suddenly in Bristol on March 31, 1954, at the age of 76. By profession a chemist he was a Fellow of the Institute of Chemistry and served with the firm of Messrs. Cook and Barke in Bristol and Bath as a public analyst from about 1925 to his retirement in 1951.

He was elected to the Society in 1907 and was a keen and active member. Shunning publicity he served mainly as a committee member and was on Council in the years 1914–1918, 1922–1923, 1933–1942. He led numerous excursions, often in collaboration with Mrs. Barke. In the field he worked with many noted Bristol geologists such as Arthur Vaughan, S. H. Reynolds and J. W. Tutcher, who in their many published works gave well-deserved praise to his careful and detailed collecting. Barke was one of the earlier school of naturalists who rather avoiding specialisation loved and understood the whole countryside and few matters of natural history escaped his keen powers of observation. It was a joy to accompany him in the field. An apparently rather brusque manner really belied his intense kindness and loyalty to his friends.

Sir Lewis L. Fermor, O.B.E., D.Sc., F.R.S.

IT was a very fortunate event for our Society when, on account of Lady Fermor's connections with the West Country, Sir Lewis and Lady Fermor came to live in Bristol at the outbreak of the war. He was a most distinguished geologist who had held the post of Director of the Geological Survey of India from 1922 till his retirement in 1935. After his retirement he went on an important mission to Malaya to report on its tin industry in 1938, and between 1945 and 1947 he took part in other missions to India, Egypt and Rhodesia.

Sir Lewis joined our Society in 1940 and was an active member of the Geological Section throughout his stay in Bristol, serving on the committee of the Section from 1941 till 1952. He was a member of Council from 1942 to 1947 and was President from 1945 to 1947. His lectures on India's mineral resources and on Gondwanaland are well remembered as well as his two Presidential Addresses on India and Rhodesia.

All who worked with Sir Lewis in the running of our Society will recall his keen interest in all its affairs and his ready devotion of his time and attention to its problems. When in 1953 he left Bristol for his new home in Surrey his distinguished figure and unassuming personality were missed. He died in Woking on May 24, 1954, at the age of 74.

The Society's sincere sympathy is extended to Lady Fermor in her loss.

BRISTOL BOTANY IN 1954

By Cecil I. and N. Y. Sandwith

(*Read in title to Council, May 5, 1955. Received Feb. 10, 1955.*)

SINCE the last meeting in Bristol of the British Association in 1930 we have passed through a period of transition in the study of the British flora, accompanied by changes in the flora itself and in the face of our countryside. These changes have been active in our district. Mr. J. W. White, who had fathered the Bristol flora for so many years, died in October, 1932, and after a gap of a few years (during which Miss I. M. Roper also died, after presenting her herbarium to Leeds University) we tried to carry on his work of recording with these annual notes and have prepared a card index of all records published since 1912. In the meantime, the *Flora of Gloucestershire* (1948) and the new *Flora of the British Isles* (1952) have appeared, and the Distribution Maps scheme for plotting the occurrence of all the higher plants has been sponsored by the Botanical Society of the British Isles and deserves the support of local workers. Vast changes have taken place in the nomenclature of our species and, more important, a number of critical plants which were unknown in Mr. White's day have become properly understood, while the stock of others has fallen. The *Hieracium* and *Rubus* lists will have to be revised when the time is ripe, and a supplement to the *Adventive Flora of the Port of Bristol* (1933) might well be issued since so many species have been added.

Since 1930 there have been remarkable discoveries of native plants new to the Bristol district, the most interesting being *Poterium officinale*, *Gentiana anglica*, *Centaurium capitatum*, *Salix undulata*, *Epipactis purpurata*, *E. leptochila*, *Potamogeton trichoides*, *Zannichellia gibberosa*, *Carex laevigata*, *Parapholis incurva*, *Poa subcaerulea*, *Glyceria declinata* and *Equisetum litorale*. *Polygala calcarea* and *Prunella laciniata* have been added to the Gloucestershire, and *Carex vesicaria* to the Somerset, side of the area, while *Callitriche truncata* has been rediscovered. Mr. A. J. Wilmott distinguished the *Sorbus latifolia* of the Avon Gorge as a new endemic species of hybrid origin and named it *S. bristoliensis*, the first flowering plant to commemorate our city. Introductions such as *Epilobium adenocaulon* and *Impatiens capensis* have arrived and extended their range while others, such as *Erigeron canadensis*, *Senecio squalidus* and *Lactuca serriola*, are increasing. Total losses are few, but we fear that *Andromeda* may have gone for ever, and *Euphorbia pilosa* at Bath and *Dianthus* *deltoides* at Keynsham have not (we believe) been seen for many years. The records of four species, *Callitriche palustris*, *Hypochoeris glabra*, *Orobanche Picridis* and *Rhinanthus major*, were probably all based on misidentifications ; on the other hand, the occurrence of *Aceras* has been established.

A number of new Hepatics have been discovered on the Somerset side, the best being the saprophytic *Cryptothallus mirabilis*, which is now known in two widely separated areas on the peat moors. Dr. Lilian Hawker's admirable monographic study of the British Hypogeous Fungi (truffles), published in the Philosophical Transactions of the Royal Society in February, 1954, was based on her own collections in the woods of our district where she and her fellow-workers discovered a species new to science and made several first records for Britain. Mention must also be made of Dr. T. A. Sprague's list of the Rust Fungi of Gloucestershire, which has just been published in the Proceedings of the Cotteswold Naturalists' Field Club.

Mr. White would have welcomed all these discoveries and researches, as well as the advances made in the study and accurate determination of British plants. He would have accepted the name-changes (apart from ill-advised splitting of genera) with philosophic chuckles, but would have been saddened by the defacing of so much of the countryside and the submergence of so many happy hunting-grounds in the " overspill " of Bristol.

The year 1954 was disastrous and cannot be enlarged upon. After a dry April there was little sun and continuous rain, cold winds, gales, blizzards and floods. People ask if our climate is changing, a question to which there is no satisfactory answer.

Once again, we have to thank Messrs. C. E. Hubbard and E. Nelmes for determining Grasses and Sedges, while Dr. C. West and Mr. E. P. Sell kindly named a number of *Hieracia* and Mr. G. M. Ash some *Epilobia*. Mr. V. S. Summerhayes spent two days here in August, examining the species of *Epipactis* in the woods at Wickwar, Wotton-under-Edge and Dursley. On one of these, a perfect summer day, the party was conducted by Mr. E. P. Bury, who most kindly showed us several interesting colonies of the orchids, including the beautiful colour form which is mentioned below.

As in past years we have abbreviated as " G.W.G." the name of Mr. G. W. Garlick, who continues to send us many valuable records from the Gloucestershire side of the district.

Ranunculus hederaceus L. Lyde Green, and Dodington Park, **G.**, *G.W.G.*

Barbarea intermedia Bor. Engine Common, Yate, **G.**, *G.W.G.*

Diplotaxis tenuifolia (L.) DC. Cogmill Quarry, Iron Acton ; and (var. *integrifolia* Koch) Cattybrook Brickworks, Shortwood, **G.**, *G.W.G.*

Sisymbrium officinale (L.) Scop. var. *leiocarpum* DC. Yate and Iron Acton, **G.**, *G.W.G.*

Viola hirta L. ssp. *calcarea* (Greg.) E. F. Warburg. Loxton Hill, **S.**, *C. H. Cummins.*

Polygala calcarea F. Schultz. Two small colonies in calcareous pasture N. E. of Hawkesbury Upton, **G.**, *G.W.G.* An excellent find, new to the Gloucestershire side of our area and to district 5 of *Fl. Glos.*

Saponaria officinalis L. Edge of Sodbury Quarry, **G.**, a garden escape, *G.W.G.*

Sagina ciliata Fr. Parkfield Colliery, Pucklechurch, **G.**, *G.W.G.*

Hypericum dubium Leers. Wood-borders on Stinchcombe Hill, **G.**, *N.Y.S.*

Rubus laciniatus (Weston) Willd. Summit of Blackdown on Mendip, **S.**, *Dr. David Prowse.* This is evidently the "American Blackberry well established on the summit ridge of Blackdown on the Mendips" reported by *F. R. Browning* in *Rep. Bot. Sect. Som. Arch. and Nat. Hist. Soc.* for 1950. *R. laciniatus* is a garden escape, but not American in origin.

Cotoneaster microphyllus Lindl. Summit of Stinchcombe Hill, **G.**, *N.Y.S.*

Sedum Telephium L. Railway embankment south of Yate Station, **G.**, *G.W.G.*

Callitriche obtusangula Le Gall. Pond, Totteroak, Horton, **G.**, *G.W.G.* Pool below Stone-edge Batch, Tickenham, **S.**, 1934, *C.I.S.*

C. intermedia G. F. Hoffm. Pool by the Mells brook, Stoke Lane Valley, Edford, 1941 ; and pond on Beacon Hill, **S.**, 1953, *C.I.S.* and *N.Y.S.*

Epilobium montanum L. × *roseum* Schreb. Wall, Bowling Hill, Sodbury, **G.**, *G.W.G.*, det. *G. M. Ash.*

E. adenocaulon Hausskn. Several localities at Winterbourne, Dodington Park, Yate, Sodbury, Horton and Lower Woods, **G.**, *G.W.G.* Woods above Wotton-under-Edge and on Breakheart Hill, Dursley, **G.**, *N.Y.S.*

Œnanthe Lachenalii C.C. Gmel. Lyde Green, **G.**, *G.W.G.*

Anthemis nobilis L. Still in very small quantity on Siston Common, **G.**, *C.I.S.* First found here by *H. J. Gibbons*, see "Bristol Botany in 1926." This important record was somehow omitted from *Fl. Glos.* Said to be introduced here, but the plant looks wild enough on this typical goose-green.

Anaphalis margaritacea (L.) Benth et Hook. fil. In five distinct spots in Westridge Wood, Wotton-under-Edge, 1952, and subsequently; and in Priest Wood, Cromhall, **G.**, *E. P. Bury.*

Doronicum Pardalianches L. Quarry under Tytherington Hill, **G.**, *G.W.G.*

Picris hieracioides L. Railway cutting between Nibley and Iron Acton, **G.**, *G.W.G.*

Crepis biennis L. For several yards by the road from Wick to Pucklechurch, **G.**, *I. W. Evans.*

Hieracium anglorum (Ley) Pugsl. Westerleigh, Engine Common, Yate Court and Chipping Sodbury, **G.**, *G.W.G.*, det. *C. West* and *P. D. Sell.* Much of what Mr. White referred to *H. sciaphilum* var. *transiens* (also the Rodway Hill "*H. diaphanoides*") comes under this species, which has smaller heads with less floccose phyllaries than the common *H. Lachenalii.*

Sonchus arvensis L. var. *glabrescens* Guenth., Grab. et Wimm. Waste ground by the Ridge Estate, Yate, **G.**, *G.W.G.*

Monotropa Hypopithys L. Under beeches in Dodington Park, **G.**, *G.W.G.*

Gentiana Amarella L. Many plants with some or all of the flowers converted into dense little tufts of pale greenish purple or purple leafy organs were found by us last September on old mining ground at Charterhouse-on-Mendip, **S.** More than a century ago, in the *Gardener's Chronicle* for 1843, p. 628, Charles Darwin described very similar specimens which he had found on a bare, dry, chalky bank (the locality was not stated).

Mentha alopecuroides Hull. Disused allotment near Westerleigh North Signal Box, **G.**, *G.W.G.* A first record for the Glos. side of the district.

Stachys × *ambigua* Sm. Hedgerow, Westerleigh Road, Yate, **G.**, *G.W.G.*

S. sylvatica L. forma *monstrosa* Druce. Hedgerow, Frampton Cotterell, **G.**, *G.W.G.* Roadside between Butcombe and Nempnett Thrubwell, **S.**, 1953–1954, *Miss M. V. Westcott.*

Galeopsis angustifolia Ehrh. Dwarf plants on scree in Goblin Combe, Cleeve, **S.**, *C. H. Cummins.*

Salix triandra L. Bank of River Frome under Bury Hill, Winterbourne Down, **G.**, *G.W.G.*

Populus balsamifera L. Dyrham Wood, **G.**, *G.W.G.*

Orchis praetermissa Druce. Damp meadow, Codrington; and Seven Springs, Dodington Park, **G.**, *G.W.G.*

O. ericetorum (E. F. Linton) E. S. Marshall. Cromhall Common, **G.**, *G.W.G.*

Platanthera chlorantha (Custer) Reichb. Frenchpiece Wood, Dodington Park, **G.**, *G.W.G.*

Cephalanthera Damasonium (Mill.) Druce. *Ibid.*, *id.*

Epipactis Helleborine (L.) Crantz. Two localities near Westerleigh, and in Dodington Park, **G.**, *G.W.G.*

E. purpurata Sm. Sticksey Wood near Kilcot, **G.**, *E. P. Bury.* A spectacular colony of most unusual plants of this species has been observed in two successive seasons in the Lower Woods, east of Wickwar, **G.**, by *Mr. E. P. Bury.* In this colony the plants show excess of anthocyanin, being entirely pinkish purple from the base up to the inflorescence, the colour being more or less that of the perianth of *Colchicum autumnale.* Specimens of the typical form are growing near by. Later on last year Mr. Bury found another fine specimen of his " Pink Orchid " in another part of these woods. Mr. V. S. Summerhayes, who has seen the original colony, hopes to write a report on it for publication in *Watsonia.*

E. leptochila (Godf.) Godf. Westridge Wood and Conygre Wood, Wotton-under-Edge, **G.**, *E. P. Bury.*

Allium oleraceum L. Field-border near Ridge Estate, Yate, **G.**, *G.W.G.*

Ornithogalum umbellatum L. Roadside between Radstock and Mells, **S.**, *I. W. Evans.*

Juncus conglomeratus L. var. *subuliflorus* Drejer. Westridge Wood, Wotton-under-Edge, **G.**, *G.W.G.* A form with a more diffuse inflorescence, not previously recorded.

J. Kochii Schultz. Boggy ground in Stoke Lane Valley between Edford and Nettlebridge, **S.**, 1941, *C.I.S.* and *N.Y.S.* Confirmed by *Mr. P. M. Benoit*, who is making a special study of this group. *J. Kochii* has usually been treated as a variety of *J. bulbosus* L., from which it differs in its six stamens and in characters of the perianth and capsule.

Potamogeton trichoides Cham. and Schl. When this addition to our flora was recorded in " Bristol Botany in 1936 ", we quoted from *Rep. Bot. Soc. and Exch. Club Brit. Isles*, 1934, p. 845 (1935), giving the locality as " near Weston-super-Mare, S., 1934 " and the finder as " Miss M. Taylor ", and this locality was repeated by Messrs. Dandy and Taylor in their paper on the British distribution of *P. trichoides*, in *Journ. Bot.* 1938, p. 168.

We have since learned that, in fact, the locality was Blagdon Lake, **S.**, and the finder was *Miss E. Claydon.* It is hoped that *P. trichoides* will be rediscovered at Blagdon. Messrs. Dandy and Taylor have verified that the specimens collected were correctly identified.

Eriophorum angustifolium Honck. Seven Springs, Dodington Park, **G.**, *G.W.G.* This must be the Tormarton locality, from a school list, given in *Fl. Glos.*

Scirpus sylvaticus L. By river, Great Elm, **S.**, *I. W. Evans.*

S. lacustris L. Pond on Inglestone Common, Wickwar, **G.**, *G.W.G.*

S. setaceus L. Seven Springs, Dodington Park, **G.**, *G.W.G.*

Carex Pairaei F. Schultz. Mr. Garlick has verified that the *C. Leersii* recorded in *White Fl.* (and repeated in *Fl. Glos.*, under *C. polyphylla*) from the common near Leap Bridge beyond Downend, **G.**, is, as would be expected on the soil of this locality, *C. Pairaei.*

C. strigosa Huds. Roadside ditch between Sodbury and Dodington, and in Dyrham Wood, **G.**, *G.W.G.*

C. lepidocarpa Tausch. Marsh, Seven Springs, Dodington Park, **G.**, *G.W.G.*

Melica uniflora Retz. forma *albida* Erick. Lane leading from East Clevedon to Clapton-in-Gordano, **S.**, 1944, *Miss E. S. Todd.* A rare and very pretty form, not previously recorded.

Poa subcaerulea Sm. Yate Common, **G.**, 1953, *G.W.G.*, det. *C. E. Hubbard.* This is the true plant of Smith, with acuminate glumes, which has hitherto been known to most authors as *P. irrigata* Lindm. The first verified record for the Bristol district, since the *P. pratensis* L. var. *subcaerulea* (Sm.) Hook. of *White Fl.* and *Fl. Glos.* may refer only to forms of *P. pratensis.*

P. angustifolia L. Wall top, foot of Bowling Hill, Chipping Sodbury, **G.**, *G.W.G.* This has been overlooked and was not mentioned, even as a variety of *P. pratensis*, in *White Fl.*

Bromus lepidus Holmberg. Roadside, Mayshill to Nibley, **G.**, *G.W.G.*

Agropyron repens (L.) Beauv. × *Hordeum secalinum* Schreb. (× *Agrohordeum Langei* (Richt.) G. Camus). This rare intergeneric hybrid was discovered by *C.I.S.* in August, 1945, in brackish pasture by the Avon near Shirehampton, **G.**, and was refound by us last August when a single large patch was noted, growing with the parents. This hybrid is new to the British flora and has been previously recorded only from Denmark. Specimens were shown at the autumn Exhibition Meeting of the Botanical Society of the British

Isles and Mr. C. E. Hubbard, who identified them, has written a note on the plant which will be published in the Proceedings of that Society.

A. caninum (L.) Beauv. Two localities near Yate Rocks, **G.**, *G.W.G.*

Brachypodium pinnatum (L.) Beauv. Dodington Park, and slope above Dyrham Wood, **G.**, *G.W.G.* A large patch has been known to us for many years by the upper Clevedon road near the entrance to Charlton Woods, beyond Failand, **S.**

Dryopteris Borreri Newm. Wooded quarries in the Frome gorge, Winterbourne Down ; Martin Croft Brake, Coalpit Heath ; and between Leechpool and Goose Green, Yate, **G.**, *G.W.G.*

Chara delicatula Agardh. var. *barbata* (Gant.) Groves and B.-Webster. Shapwick, **S.**, *A. J. Dodd*, det. *G. O. Allen*, see *Proc. B.S.B.I.*, vol. 1, pt. 2, p. 185 (1954).

Tolypella intricata Leonh. Pond, Little Sodbury End, Sodbury Common, **G.**, *G.W.G.*

ALIENS. It was a barren season at Avonmouth Dock, **G.**, and we found only two species worth noting, *Sisymbrium septulatum* DC. and *Avena sterilis* L. Other collectors fared no better there. *Mr. C. C. Townsend* had an interesting find at Avonmouth in 1953, viz., *Medicago rigidula* (L.) Desr. var. *minor* (S r.) Thell., which he grew from seed. *Geranium pusillum* L., which was not recorded in the *Adventive Flora*, was gathered by us both at Avonmouth and Ashley Hill, **G.**, in 1934. *Mr. I. W. Evans* found *Vicia bithynica* L. last summer on waste ground at Horsefair, Bristol, **G.**

Saxifraga Cymbalaria L. var. *Huetiana* (Boiss.) Engl. Established in an open wood on a private estate near Tockington, **G.**, *Mrs. W. Cummins.* An interesting note on this delicate little golden-flowered Saxifrage appeared in the *N.W. Naturalist*, vol. 21, 39–41 (1946) ; see also *B.E.C.* 1946–47 Rep., 262 (1948). It is a native of N. Asia Minor and Armenia.

Symphytum grandiflorum DC., *Trachystemon orientalis* D.Don and *Arum italicum* Mill. were found established in woodland at Horton, **G.**, by members of the Botanical Section of this Society on one of the spring excursions.

Verbascum speciosum Schrad. Railway bank, Wickwar, **G.**, *E. P. Bury.*

Bromus madritensis L. Quarry, Winterbourne, **G.**, 1941, *I, W, Evans.*

HEPATICS. *Fossombronia pusilla* (L.) Dum. Parkfield Colliery ; and Cogmill Quarry, Frampton Cotterell, **G.**, *G.W.G.*

Lophozia excisa (Dicks.) Dum. Quarry near Cogmill, Iron Acton, **G.**, *G.W.G.*

Gymnocolea inflata (Huds.) Dum. and *Scapania compacta* (Roth) Dum. Heathy ground on Siston Common, **G.**, *C.I.S.* and *N.Y.S.*

ADDITIONS TO THE FLORA OF STEEP HOLM, **S.** *Mrs. M. L. Davis* led a party of botanists to the island on May 15th, when tiny plants of *Potentilla reptans* L. were observed for the first time on the summit plateau. *N.Y.S.* added three Hepatics, *Reboulia hemisphaerica* (L.) Raddi, *Plagiochila spinulosa* (Dicks.) Dum. and *Lophocolea bidentata* (L.) Dum.; and two Mosses, *Fissidens cristatus* Wils. and *Mnium rostratum* Schrad. These were kindly identified at Kew by *Miss J. Taylor*. The *Reboulia* had already been found on the island by *Dr. W. Watson*, as he has added, in writing, the note " Steep Holm " (without date) to the printed records of this species in the copy he gave us of his " Liverworts of Somerset." In the same way, he has recorded *Marchesinia Mackaii* (Hook.) Gray from Steep Holm, a further addition to the flora of the island. The fresh-water Alga, *Prasiola crispa* (Lightf.) Menegh. (det. *Miss C. I. Dickinson*), was found by *Mr. O. Buckle* in water among abandoned military buildings.

ORNITHOLOGICAL NOTES, BRISTOL DISTRICT, 1954

Compiled from Reports of Members of the B.N.S. Ornithological Section

By H. H. Davis and P. J. Chadwick

(*Read in title to Council, May 5, 1955. Received March 20, 1955*)

THE Severn Estuary, the reservoirs, and other favoured haunts have again been under frequent review, and records for 1954 show a greater proportion of highly interesting occurrences than in any previous year. Thanks are due to all who have forwarded their observations, and especially to the Bristol Waterworks Company for allowing access to the site of the Chew Valley scheme, where the new, and partially filled, reservoir[1] has been the constant resort of an immense population of birds, and from time to time has attracted species seldom met with beforehand in the District.

Outstanding records from Chew Valley include those of Greylag Geese in March–April ; a Spoonbill, a Little Ringed Plover and a Turnstone—all in May ; Black Terns in unprecedented numbers in early August ; and Marsh Harriers in August–September. From Chew Valley, too, there are reports of the successful breeding of Shoveler and Tufted Duck, and the attempted breeding of Black-headed Gulls. Among autumn waders at the same reservoir were Black-tailed Godwits, Wood Sandpipers, Greenshanks, a Knot, Little Stints, a Temminck's Stint, Sanderlings and Ruffs. At Blagdon reservoir Ruffs were seen in January ; Gadwall in January, March and December ; and a Shag in November, while the most important record from Barrow Gurney is of an Iceland Gull in December. From Cheddar reservoir there are reports of Gadwall in January–February ; a Bittern in February ; a Roseate Tern in May ; a Grey Phalarope in September ; and Black-throated Divers and a Red-throated Diver in December.

From coastal areas are records of a Sabine's Gull at Weston-super-Mare in August and a Grey Phalarope at Clevedon as late as December. In higher reaches of the Estuary an exceptionally large passage of Black Terns was seen at Sheperdine and the New Grounds in May ; a party of fifteen Little Terns was reported from Purton in September ; and Spotted Redshanks were identified at

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[1] Quoted in Ornith Notes, 1953, as Chew Stoke reservoir, but here referred to throughout as Chew Valley reservoir.

Sheperdine in November. Among records of special note from the New Grounds are those of Whooper Swans and Ruffs in February ; a Common Scoter in March ; Avocets in August ; two Glaucous Gulls in December ; and a Long-tailed Duck on the canal, November–December. From January to March several Lesser White-fronts, up to four Barnacle Geese and a Red-breasted Goose were visitors of particular interest among common White-fronts at the New Grounds and, at the same place, Pink-footed Geese, with a peak total of 120, were again at maximum strength in early November.

Noteworthy observations from other localities are of Crossbills at Wrington in January ; an Iceland Gull on the R. Avon in March ; a Hoopoe at Ubley in May ; and a Short-eared Owl on Mendip in September. A Golden Oriole—the first to be reported for more than half a century was heard and seen in Leigh Woods in May, and two visited Littleton-on-Severn in June, while a Wryneck was trapped at Long Ashton, and another found dead at Wrington, in August, and a Willow Tit was twice observed at Little Stoke in December.

Unless otherwise stated the records below refer only to 1954 and, for the most part, are the result of contributions by the following members—R. Angles, Miss B. M. Bigg, A. E. Billett, P. F. Bird, H. J. Boyd, Col. G. A. Bridge, B. K. Brooke, M. A. Bullen, G. C. Buxton, Mrs. S. I. Buxton, Miss K. M. Cary, P. J. Chadwick, Miss G. G. Clement, G. E. Clothier, D. M. Cormack, R. S. Cormack, Miss D. Crampton, R. V. Culverwell, H. H. Davis, E. E. Dunn, H. Dunnicliff, D. R. Hamblett, R. G. Hamilton, W. A. Holmes, B. King, H. R. H. Lance, Mrs. J. M. Lance, A. C. Leach, G. Mogg, H. W. Neal, P. J. M. Nethercott, Mrs. B. C. Palmer, Miss E. M. Palmer, W. T. Pares, Canon E. W. Plowright, R. H. Poulding, J. A. Pryce, W. L. Roseveare, J. H. Savory, Peter Scott, T. B. Silcocks, M. Tucker, Miss C. A. L. Wareham, Miss F. Wareham, H. F. Webb, N. Webb and M. A. Wright. Observations are followed by the appropriate initials, with names of non-member contributors in full.

The area covered is that part of Gloucestershire (**G.**) lying east of the Severn and south of a line from the New Grounds to the county boundary at Tetbury, and Somerset (**S.**) north of the R. Axe from Brean Down to Wells and a line thence to the county boundary near Frome. For the purpose of this Report the area extends westward into the Channel and Estuary to include the islands of Steep Holm and the Denny (cf. Sketch Map, *Proc. B.N.S.*, 1947, p. 225).

BLACK-THROATED DIVER *Colymbus arcticus*

S. Two, evidently immatures, watched in good sunlight with 30 × telescope, Cheddar res., Dec. 17 ; birds, described as being a little larger than a nearby Red-throated Diver, first identified by B.K. and W.L.R., who have supplied full details. Seen also on 18th (C.A.L.W. *et al.*) but not subsequently. First record for Cheddar and third only for the District.

RED-THROATED DIVER *Colymbus stellatus*

S. One, sometimes two, reported from Cheddar res., various dates, Dec. 5–19 (B.K.B., K.M.C., N.W. *et al.*). B.K. records that, as with most examples in recent years, both birds showed evidence of being oiled.

GREAT CRESTED GREBE *Podiceps cristatus*

S. Bred as usual, Blagdon res.—at least three pairs with young noted, Aug. 1 (P.J.C.). May have bred, Chew Valley res., where twelve seen, including pair with almost fully grown young, Aug. 15 (B.K.).

RED-NECKED GREBE *Podiceps griseigena*

S. One, Cheddar res., Jan. 8, 1953 (cf. *Rep. Som. Birds*, 1953, p. 6).

SLAVONIAN GREBE *Podiceps auritus*

S. Single bird, Cheddar res., several dates, Jan. 31–Feb. 14, and two, Feb. 21, 28 (W. B. Alexander, P.J.C., H.H.D.).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. Two, Cheddar res., Sept. 6 (G. Boyle) and up to three, various occasions, Dec. 5–31 (K.M.C., W.A.H., H.R.H.L., E.W.P. *et al.*). One, Barrow Gurney resrs., Dec. 12 (P.J.C.).

LITTLE GREBE *Podiceps ruficollis*

G. Ad. and two young at clay pits, Littleton-on-Severn, June 26 (A.C.L.).

S. Two pairs bred, Litton res. (A. Tyte per P.J.C.).

MANX SHEARWATER *Puffinus puffinus*

G. Remains of dead bird, Severn Beach, Sept. 21 (H.W.N.).

GANNET *Sula bassana*

G. One, evidently in its second year, found exhausted, Coalpit Heath, July 18 ; subsequently recovered and was released in the Estuary at Aust (R. M. McCready per P.J.C.). Remains, probably third year bird, Severn Beach, Aug. 26 (P.J.C.).

CORMORANT *Phalacrocorax carbo*

G. Records from the Estuary include those of four in flight over Aust Cliff, Nov. 11 (P.J.C.) and one, Sheperdine, on 24th (E.E.D., H.F.W.).

S. Highest number noted at reservoirs—eleven, Cheddar, Mar. 7 (P.J.C., B.K.). First records from Chew Valley res. are of two, May 9 (D.C.) and one or two on various dates, Sept.-Oct. (B.K.B., B.K., R.H.P. *et al.*). Four, Blagdon res., Nov. 14 (G.C.B., S.I.B.).

SHAG *Phalacrocorax aristotelis*

S. One, immature, Blagdon res., Nov. 14; this, or another, found dead, same place, on 21st had been ringed at Bardsey Is. Observatory, June 27 (B.K.B.). Close views of immature bird, evidently storm driven, on Marine Lake, Weston-super-Mare, Dec. 4 (B.M.B., H.R.H.L.).

HERON *Ardea cinerea*

G. Nest with two fledged young, Lower Almondsbury, June 22 (A.E.B.).

S. Twenty-nine occupied nests (28 in four ash trees and one in oak), Brockley Combe, May 1 (B.K., B.K.B., N.W. *et al.*). 22 occupied nests in 20 trees (including ash, oak, beech, poplar, chesnut and fir), Uphill Grange, Mar.–May (W.L.R.). Records of occupied nests at other heronries are of three, Warleigh Wood, nr. Bath, Apr. 21 (Miss C. J. H. Rogers) and three, Orchardleigh, nr. Frome, on 22nd (Miss E. D. Overend).

BITTERN *Botaurus stellaris*

S. One, first seen in reed bed and afterwards in flight, at claypits, Cheddar res., Feb. 17 (M. Chard per B.K.).

SPOONBILL *Platalea leucorodia*

S. Adult seen at 150 yards range, Chew Valley res., May 2; bird feeding in usual style, with bill immersed and side to side motion of head (B.K.).

MALLARD *Anas platyrhyncha*

S. Coastal returns of 140 off Brean Down, Feb. 14, and same number off Clevedon, Sept. 5; *c.* 100, Axe Estuary, Oct. 10 (P.J.C.). Max. count, Blagdon res.: 330, Jan. 31, and at Cheddar res.—125, Feb. 7 (P.J.C., B.K.). Exceptional mid-summer totals of 220, June 3, and 600, July 18, at Chew Valley res.; several counts of 500 or more, same place, early Aug.–late Oct., while total of 1,000, Dec. 17, is largest inland count yet returned (B.K.). Various breeding records from Chew Valley include a note for May 15 of three females with broods of twelve, eleven and six respectively (B.K.).

TEAL *Anas crecca*

G. Party of twelve, R. Avon above Sea Mills, Feb. 2 (A.C.L.). At least 1,600 on Estuary, New Grounds, Dec. 3 (H.J.B.).

S. Reservoir totals include those of 380, Blagdon, Jan. 31; 330, Barrow Gurney, Jan. 30, and 820, same place, Dec. 27 (G.E.C., B.K.). Exceptional spring count of at least 800, Chew Valley, Mar. 21, and minimum counts at same reservoir of 1,300, Dec. 17, and 1,050 on 26th (B.K.). Max. total for coastal areas—227 off Brean Down, Dec. 27 (T.B.S.).

GARGANEY *Anas querquedula*

G. Two, New Grounds, Mar. 20, and two, Sept. 11–14 (H.J.B.).

S. A male, Chew Valley res., May 2, 14 (B.K.) and two males, Aug. 3 (P.J.C., H.H.D., B.K.).

GADWALL *Anas strepera*

S. Male, Cheddar res., Jan. 3, 10, Feb. 7 (P.J.C., B.K., E. G. Richards) and male and two females, Feb. 27 (C. H. Fry). Up to three, Blagdon res., various dates, Jan. 3–31 (P.J.C., B.K.), and a pair Mar. 31 (B.K.B.) and Dec. 4 (T.B.S.).

WIGEON *Anas penelope*

G. About 75, Severn Beach, Jan. 11 (H.D.) and at least 700, New Grounds, on 12th (H.J.B.).

S. Max. totals, Blagdon res. : 478, Jan. 31 ; 363, Feb. 7 ; and 257, Mar. 7 (P.J.C., B.K.). Several very large counts from Chew Valley res., including those of 760 or more, Mar. 14, 21 (B.K.) and 785, Dec. 19 (G.C.B., S.I.B.) ; pair close in to reservoir bank, same place, on unusual date of July 18 (B.K.). Highest coastal count—120, Yeo Estuary, Feb. 10 (W.L.R.).

PINTAIL *Anas acuta*

G. Several exceptionally high totals reported from the Estuary, New Grounds, including 200, Feb. 8 ; 112, Mar. 7 ; 223, Dec. 15 (H.J.B.) ; and 273 males (females not counted) on 28th (P.S.).

S. Small numbers, Blagdon and Cheddar resrs., various occasions, Jan.–Mar. and Nov.–Dec. (B.K.B., P.J.C. *et al.*). Twenty-eight, Chew Valley res., Feb. 27, and 70 (largest total yet from the reservoirs), same place, Mar. 21 (B.K.). Coastal record of 62 off Brean Down, Jan. 12 (A.G. Dixon).

SHOVELER *Spatula clypeata*

S. A few, Barrow Gurney resrs., Jan. (A.C.L., H.R.H.L. *et al.*), but not more than one or two at any time, Cheddar, while from Blagdon the only noteworthy total is that of 46, Jan. 3 (P.J.C., B.K.). From Chew Valley res. are counts of 60, Mar. 21 ; 30 as late as June 13 (B.K.) ; 116, Dec. 19 (G.C.B., S.I.B.) and 145 on 28th (P.J.C.). At least three pairs bred successfully, same reservoir (B.K.). Thirty-one on flooded fields, Long Ashton, Nov. 28 (P.J.C.).

SCAUP *Aythya marila*

S. A female, Cheddar res., Jan. 3, and another (or same), Mar. 7 (P.J.C., B.K.). Records from Blagdon are of an ad. male found dead, Feb. 6 (P.J.C.), and of females—one, Feb. 7; two, Apr. 4; and one, Oct. 31 (B.K.). A male, Clevedon bathing pool, Feb. 10 (G.C.B., S.I.B.). Single female, Chew Valley res., Dec. 5, 8 (B.K.).

TUFTED DUCK *Aythya fuligula*

S. Max. counts at reservoirs—Blagdon : 180, Jan. 3 (P.J.C., B.K.) and *c.* 300, Nov. 13 (H.R.H.L., J.M.L.) and Dec. 3 (G.C.B., S.I.B.) ; Barrow Gurney : 60, Jan. 17, and 85, Dec. 12 (P.J.C.) ; Cheddar : 128, Jan. 24 (P.J.C., B.K.) ; Chew Valley : 75, Apr. 24 (D.C.) and 340, Dec. 19 (G.C.B., S.I.B.). Highest total, Orchardleigh, 52, Mar. 7 (Miss E. D. Overend). At least three pairs bred successfully, Chew Valley res. (P.J.C., H.H.D., B.K.).

POCHARD *Aythya ferina*

S. Noteworthy reservoir totals include 340 (227 males), Cheddar, Jan. 3, and 318, Feb. 7 (P.J.C., B.K.) ; and 300-400, Blagdon, various dates, Nov.–Dec. (G.C.B., H.R.H.L. *et al.*). Several counts of 800 or more, Chew Valley res., Nov.–Dec. (G.C.B., B.K.) ; at least 1,200, same place, Dec. 17 (B.K.). Party of six in flight over Brean Down, Nov. 7 (P.J.C.).

GOLDENEYE *Bucephala clangula*

S. Reported from the reservoirs in small numbers, various dates, Jan.–Apr. and Nov.–Dec. Max. returns of 22, Cheddar, Jan. 31, and 39, Blagdon, Mar. 10 (B.K.). Records from Chew Valley res. are of single birds, Apr. 17 (B.K.), Dec. 28 (P.J.C.), and of two, Nov. 14 (B.K.).

LONG-TAILED DUCK *Clangula hyemalis*

G. A first winter male visited the ship canal, Slimbridge, about Nov. 13, and remained till Dec. 10, when it was unfortunately shot (S. T. Johnstone *et al.* per H.J.B.).

COMMON SCOTER *Melanitta nigra*

G. One, a female, New Grounds, Mar. 20, 21 ; bird seen at a watercourse on pasture land between W.T. enclosures and the saltings (D. Scarles).

EIDER *Somateria mollisima*

S. A female off Brean Down, Jan. 28, Feb. 14, and Mar. 18 (P.J.C., B.K., W.L.R.) may have been the bird reported from same place in previous Dec. (cf. *Proc. B.N.S.*, 1953, p. 391).

GOOSANDER *Mergus merganser*

G. Two on Estuary, New Grounds, Jan. 22 (D. Scarles per H.J.B.).

S. Reported from the reservoirs : one or two, Barrow Gurney, various dates, Jan.–Feb. (M.A.B., A.C.L. *et al.*) ; up to four, Blagdon, various dates, Jan.–Apr. (B.K.B., G.G.C., J.A.P., C.A.L.W. *et al.*) and single bird, Dec. 4 (T.B.S.) ; two, Chew Valley, Feb. 27, Dec. 26 (B.K.) ; while records from Cheddar include those of eight (3 ad. males), Jan. 31 (B.K.) ; eight (4 ad. males), Feb. 4 (W.L.R.) ; nine (4 ad. males) on 7th ; eight (all redheads) on 21st ; and five, Mar. 7 (P.J.C., B.K.). Party of eight (3 ad. males) settled in Axe Estuary, flying in from direction of Cheddar res., Feb. 14 (P.J.C., B.K.).

SMEW *Mergus albellus*

G. Single redhead, R. Avon, above Sea Mills, Feb. 2 (A.C.L.).

S. Most records from Blagdon res., where birds frequently noted, early Jan. to third week of March, with max. totals of fourteen (6 ad. males), Feb. 21 (B.K.) ; thirteen (3 ad. males) Feb. 27 (C.A.L.W., F.W.) ; and fourteen (3 ad. males), Mar. 7 (P.J.C.). Ad. male, Barrow Gurney resrs., Feb. 7 (R.V.C.), and single redheads, same place, Jan. 30 (P.J.C., B.K.) ; Cheddar, Jan. 24 (B.K.), Feb. 4 (W.L.R.) and 21 (P.J.C.) ; and Chew Valley, Feb. 27 (B.K.).

SHELD DUCK *Tadorna tadorna*

S. Max. totals in coastal areas : 124 off Brean Down, Feb. 7 (Miss L. Garrard per B.K.) ; *c.* 450, Axe Estuary, Oct. 2, 10 (G.C.B., S.I.B., P.J.C.) ; *c.* 230, Weston Bay, Oct. 27 (W.L.R.) ; and 200 or more, Sand Bay, Nov. 11–28 (H.R.H.L., J.M.L., T.B.S.). The only reservoir records are from Chew Valley, where up to five seen, various dates, Apr.–June (D.C., B.K.) and single birds on three occasions, Oct.–Dec. (B.K.).

GREYLAG GOOSE *Anser anser*

G. Three, first reported from New Grounds in previous Dec., remained in the vicinity of the Wildfowl Trust enclosures till Mar. 30, but were not seen subsequently (H.J.B.).

S. Party of three visited Chew Valley res. in early spring and stayed several weeks. First noted, Mar. 21 (B.K.) and observed on subsequent dates to Apr. 13 (B.K.B., G.C.B. *et al.*) ; seen also by P.S., who pronounced them a family party of two adults and an immature.

WHITE-FRONTED GOOSE *Anser albifrons*

G. New Grounds : Jan. numbers lower than usual, not reaching 2,000 until 22nd, and rising to 2,250 by Feb. 8 (H.J.B.). Subsequent rapid build-up, actual counts of *c.* 3,900 being returned on Feb. 20, 21 (H.J.B., B.K.) and 3,600 on 24th (H.J.B.). At least 3,250 still present, Mar. 2, and 2,500 on morning of 7th, but only 1,450 that evening. About 750 counted Mar. 20, thereafter rapid decrease ; last seen, party of five, on 27th (H.J.B.). Autumn arrivals later than usual and numbers relatively small. First reported, party of thirteen, Oct. 9, while not more than 80 to end of Nov. Count of 394, Dec. 3, after which a steady increase to *c.* 1,000 at close of year (H.J.B.). Records from elsewhere are of 16, Hambrook, Jan. 27 (R.H.P.) and 70 over Stoke Bishop, Feb. 7 (A.C.L.).

S. About 30 over Long Ashton, Jan. 30 (P.J.C.) and *c.* 200 over Chilcompton, Feb. 8 (Miss E. D. Overend). Thirty on water, Barrow Gurney resrs., Jan. 26 (ranger per B.K.) and 35, same place, Feb. 8 (M.A.W.). Twenty-two over Cheddar res., Jan. 28, and 43 in nearby field, Feb. 14 (R. E. Jones per B.K.); skeins of 28 and 26 over same reservoir, Feb. 7 (P.J.C., B.K.). Seen, Chew Valley res. on various occasions, the following being recorded—24 Feb. 13, 20 (D.C.) and 16 on 27th (B.K.); 16, Mar. 7, 14 (G.C.B., B.K.), and seven on 21st (B.K.).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Adult, first reported at New Grounds in previous Oct., remained to Feb. 15 or later. Another ad., same place, Jan. 25–Mar. 5; a third on Feb. 25 only, and a first-winter bird, Jan. 16–Mar. 2 (H.J.B.).

BEAN GOOSE *Anser fabalis*

G. First winter bird, New Grounds, Feb. 7–13 (H.J.B.).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. Up to eight, New Grounds, various dates, Jan.–early Mar., seven staying as late as Mar. 17 (H.J.B.). First autumn arrivals, same place—fifteen, Sept. 19 (P.J.C., H.H.D.), increasing to 109, Oct. 7, and max. of 120, Nov. 6; 84 still remaining, Dec. 19, and 55 on 20th, but thereafter only one or two to end of year (H.J.B.).

BRENT GOOSE *Branta bernicla*

G. Immature bird of dark-breasted form, *B. b. bernicla*, first seen, New Grounds, in previous Nov., remained to Jan. 25 or later (H.J.B., P.J.C., H.H.D. *et al.*).

BARNACLE GOOSE *Branta leucopsis*

G. Two, New Grounds, Feb. 8, and up to four, various occasions, to Mar. 17 (H.J.B., P.J.C., B.K.). One, same place, Dec. 19 to 31st (H.J.B.).

RED-BREASTED GOOSE *Branta ruficollis*

G. One, first winter bird, seen among White-fronts at New Grounds, frequent intervals, Jan. 8–25, and again Feb. 13 to Mar. 5 (H.J.B., P.J.C., H.H.D., B.K., P.S. *et al.*); third Gloucestershire record (cf. *Brit. Birds*, XXXV, p. 83; XLVIII, p. 136).

MUTE SWAN *Cygnus olor*

S. Sixty-four on R. Avon, Bath, June 3 (B.K.). Highest reservoir totals: 55, Blagdon, July 22 (W.L.R.) and 52, Aug. 29 (C.A.L.W., F.W.). Forty-three on flooded fields, Long Ashton, Oct. 24, 30 (M.A.W.).

WHOOPER SWAN *Cygnus cygnus*

G. Two ads. on saltings, New Grounds, Feb. 9–12 (H.J.B.).

BUZZARD *Buteo buteo*

G. Two over New Grounds, Jan. 16 (B.K.) and two, Codrington, on 18th (G.M.). One, sometimes two, Wotton-under-Edge area, various dates, Mar.–May and Aug.–Nov. (H.F.W.). Inconclusive report of a pair nesting, Tortworth (A.E.B.), but no further breeding information (survey of *c.* 400 sq. kms. by 18 members). Single birds, Cromhall, Apr. 25 (A.E.B.); Little Stoke, May 15 (H.H.D.); Aust, Sept. 6 (H.W.N.) and Charfield on 15th (M.A.B.).

S. One, Steep Holm, Apr. 6, heading for Brean Down from direction of Welsh coast (P.J.C., R.H.P.). Nine pairs believed breeding in area of 80 sq. kms. of northern section of Mendip Hills from Uphill to Blagdon, but only five nests located—Blagdon, Cheddar (2), Churchill and Hutton (survey by 10 members). Other breeding season records include: pair with nest, Butcombe Creek, and second pair over nearby wood, Apr. 18 (P.J.C.); pair, Bourton Combe, May 28 (G.A.B., G.E.C.); and single birds, Ebbor Gorge, nr. Wells, Apr. 1 (H.D.); Chewton Mendip and East Harptree, Apr. 24, and Batcombe, Cheddar, May 8 (P.J.M.N.). Pairs probably bred in two localities near Wells (C. H. Fry).

MARSH HARRIER *Circus aeruginosus*

S. One, a juvenile in dark chocolate-brown plumage, with small amount of cream on crown and nape, Chew Valley res., various dates, Aug. 16–31 or later (B.K.B., G.C.B., D.C., H.W.N.). What was evidently a second bird, described as female or immature, with light buff shoulder markings and cream on crown extending to mantle, reported from same place, Sept. 19 (B.K., R.H.P.).

HOBBY *Falco subbuteo*

G. Single birds overhead, Little Stoke, May 20, June 28 (H.H.D.).

S. One, Whitchurch, Aug. 6 (B.K.B.) and Chew Valley res. on 24th (B.K.).

PEREGRINE *Falco peregrinus*

G. Ad. shot, Northwoods, Winterbourne, Mar. 13 (Dr. J. Cates per H.H.D.). Single birds, Tockington, July 25 (A.E.B.); Aust Cliff, Oct. 31 (J.A.P.); and Sheperdine, Nov. 24 (Rev. G. W. H. Moule, H.F.W.).

S. One, Steep Holm, Apr. 3, and a pair Sept. 4, but no direct evidence of breeding (G.E.C., P.J.C., R.H.P.). Probably bred Brean Down, where pair seen, May 27, June 26, and a juvenile watched in flight on 29th (W.L.R.). Other coastal records are of single birds, Sand Point at frequent intervals (B.K., W.L.R. T.B.S.); Yeo Estuary, Aug. 26, Dec. 18 (B.K.B., T.B.S.); and Clevedon, Feb. 10 (H.R.H.L.). Reservoir records are of one, Blagdon, Jan. 31 (P.J.C., B.K.) and Chew Valley, Aug. 29, Sept. 19 (R.H.P.).

MERLIN *Falco columbarius*

S. Twice reported—a male, Weston-super-Mare, Oct. 29 (H.R.H.L.) and a female or immature, Chew Valley res., Nov. 14 (B.K.).

KESTREL *Falco tinnunculus*

G. One over Broad Plain, Old Market, Bristol, Dec. 19 (R.H.P.).

S. Two flying eastwards off Steep Holm, Sept. 4 (G.E.C., P.J.C., R.H.P.).

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. Injured bird beneath telegraph wires, Claverton Down, Bath, Mar. 16 (E. Smith per B.K.). Pair, Saltford, May 13 (B.K.).

WATER RAIL *Rallus aquaticus*

G. Again seen at small pond, Wick, where single bird noted daily, Jan. 21–27 (D.R.H.).

S. One, Ubley, Jan. 17, and two, various dates, Feb.–Mar. (G.G.C., K.M.C., C.A.L.W., F.W.). One, Monkton Combe, several occasions, Feb. 18–Mar. 11 (A .G. Dixon). Three or more in large bed of spartina grass on mud-flats, north end of Sand Bay, Mar. 6, and single birds seen or heard, same place, Nov. 13, Dec. 11 ; observations in present year, and in Oct., 1953, show that when disturbed by unusually high tides the birds fly to the cover of bramble bushes on adjoining slopes of Sand Point and return later to the spartina bed (R.A.). One calling, Cheddar clay-pits, Dec. 5 (B.K.).

COOT *Fulica atra*

S. At least 40 nests, Chew Valley res., May 30 (B.K.). Count of 400 or more birds, same place, Oct. 17—number rising to c. 2,000 by Dec. 17 (B.K.).

OYSTERCATCHER *Haematopus ostralegus*

G. One, Sea Mills, R. Avon, Feb. 25 (W.A.H.). One on pasture, Oldbury-on-Severn, Oct. 2 (R.H.P.).

S. Coastal records include those of 50 or more, Brean Sands, Feb. 14 (P.J.C., B.K.) and Mar. 18 (W.L.R.) ; 50, Sand Bay, Aug. 25 (E.E.D., H.F.W.) and 41, Nov. 7 (T.B.S.) ; 75, Weston Bay, Oct. 21 (T.B.S.) and 100, Nov. 19 (H.R.H.L., J.M.L.). Twice reported from the reservoirs—three in flight, Chew Valley, Aug. 3 (P.J.C., H.H.D., B.K.) and three on mud-bank, same place, Sept. 26 (G.C.B., S.I.B.).

LAPWING *Vanellus vanellus*

G. Count of 300 or more, New Grounds, Aug. 22 (E.E.D. H.F.W.).

S. About 1,500 over Weston Airport, Jan. 22 (W.L.R.). Abundant, Chew Valley res., mid-Aug. to end of year ; max. total of at least 1,000, Dec. 17 (B.K.).

RINGED PLOVER *Charadrius hiaticula*

G. Highest figures from the Estuary : *c*. 300, New Grounds, May 23 (H.F.W.) and 275, Severn Beach, Aug. 26 (P.J.C.).

S. Coastal reports of 80, Sand Bay, Aug. 25 (E.E.D., H.F.W.)

and 50, Weston Bay, Dec. 1 (H.R.H.L., J.M.L.). Up to 14, Chew Valley res., various occasions, May-Sept. (G.C.B., D.C., B.K. *et al.*).

LITTLE RINGED PLOVER *Charadrius dubius*

S. One clearly identified, Chew Valley res., May 9; bird, in close company with four Ringed Plover, under intermittent observation with binoculars and telescope for more than an hour, at ranges down to 25 yards. Second record for the County and first for the Bristol area (B.K.) (for confirmatory details see *Rep. Som. Birds*, 1954).

GREY PLOVER *Squatarola squatarola*

G. Four, New Grounds, Jan. 17 (R.H.P.) and five, Sheperdine, Nov. 7 (E.E.D., H.F.W.).

S. One spring record—four, Yeo Estuary, May 9 (B.K.B.). Up to six, Sand Bay and Yeo Estuary, various dates, Aug. to end of year (R.A., H.R.H.L., T.B.S. *et al.*).

TURNSTONE *Arenaria interpres*

G. Counts of 180, Severn Beach, Aug. 26, and 195, Sept. 16 (P.J.C.). Reported also from Oldbury-on-Severn—35, Mar. 28 (H.F.W.) and Sheperdine—15 or more, Oct. 2 (R.H.P.), Nov. 7 (H.F.W.).

S. Single bird on rocks, Steep Holm, Apr. 5; first record for the island (D.M.C., R.H.P., M.T. *et al.*). One inland, Chew Valley res., May 14, 23 (B.K.).

COMMON SNIPE *Capella gallinago*

S. Seventy put up from marsh land, Cheddar res., Mar. 7 (P.J.C., B.K.). At least 100 flushed from marshy ground, Chew Valley res., Aug. 15 (B.K.); several small groups seen to combine in flight into one flock of 76, same place, Nov. 28 (P.J.C.).

JACK SNIPE *Lymnocryptes minimus*

G. Two, Wotton-under-Edge, Feb. 21 (H.F.W.) and one, New Grounds, Nov. 6 (H.J.B.).

S. Single bird, Chew Valley res., Nov. 14, and two, Dec. 5 (B.K.).

WOODCOCK *Scolopax rusticola*

G. One, Stinchcombe Hill, Nov. 7 (D.R.H.). Two or more, Wolfridge Wood, Alveston, Dec. 27 (H.H.D.).

S. About 20 in a covert nr. Radstock, Jan. 2 (E. G. Holt). Single birds, Hutton Wood, Feb. 26 (W.L.R.) and Kewstoke Woods, Nov. 7 (R.A.).

WHIMBREL *Numenius phaeopus*

S. Inland records of up to three, Cheddar res., several occasions, May 5-9 (G. Boyle, B.K.); five, Kenn Moor, May 8 (B.K.B.); two, Chew Valley res., May 9, 14, and one, Aug. 7 (B.K.).

BLACK-TAILED GODWIT *Limosa limosa*

G. Two on Estuary, New Grounds, July 31 (D.R.H.); up to 20, same place, various dates, Aug.-Oct. (H.J.B.).

S. Fourteen, Chew Valley res., Apr. 3 (B.K.B.); single bird, same place, May 20 (B.K.) and one or two, several occasions, July-Aug. (R.H.P., B.K.). One, mouth of Avon, Sept. 17 (W.A.H.).

BAR-TAILED GODWIT *Limosa lapponica*

G. One, mouth of Avon, Jan. 31 (R.H.P.), Sept. 5 (J.A.P.). Two on Estuary, Sheperdine, Sept. 5 (R.H.P.) and three, Severn Beach, on 7th (W.A.H.).

S. Single birds, Sand Bay, Feb. 6 (R.A.), and Axe Estuary, Apr. 10 (H.H.D.). Small numbers, Sand Bay and Yeo Estuary, at frequent intervals, Sept.-Oct. (various observers), with max. of 20, Sand Bay, Sept. 26 (T.B.S.).

GREEN SANDPIPER *Tringa ochropus*

G. One, New Grounds, Jan. 1 (H.J.B.) and one at farmyard pool, Little Stoke, Aug. 18 (H.H.D.). Single birds, Sheperdine, Aug. 8 (R.H.P.), Oct. 2 (Rev. G. W. H. Moule); and Berkeley Pill and Oldbury-on-Severn, Oct. 2 (R.H.P.).

S. Frequent, Chew Valley res., July-Oct.—usually up to three or four, but max. of seven, Aug. 15 (various observers); single birds, same place, Mar. 14, Nov. 21, Dec. 8, 28 (P.J.C., B.K.). Two, Litton res., mid-Nov. (A. Tyte per P.J.C.) and one, Dec. 8 (B.K.). One put up from tide-line (exceptional in such habitat), Sand Bay, Sept. 18 (R.A.).

WOOD SANDPIPER *Tringa glareola*

S. Two, sometimes three, Chew Valley res., several occasions, Aug. 7–28 (G.C.B., S.I.B., B.K.).

COMMON SANDPIPER *Actitis hypoleuca*

S. Count of 59, Cheddar res., Apr. 25 (B.K.). At least 15, Sand Point, July 29 (W.L.R.). One, evidently wintering, Chew Valley res., Dec. 28 (B.K.).

REDSHANK *Tringa totanus*

G. Nesting proved, Oldbury-on-Severn, July 4, when half-grown young bird found on river-bank and two or three pairs seen, evidently holding breeding territories (R.H.P.). Max. figures for organised counts on Estuary: 127, New Passage, Aug. 8; 142, Aust, Sept. 5; and 107, Oldbury-on-Severn, Oct. 2 (R.H.P.).

S. Five nests located, Portbury, May 23 (G. Bright). Reservoir records of two, Blagdon, Jan. 10 (W.L.R.) and up to eight, Chew Valley res. (where one or two pairs probably bred), various occasions, Apr.–Sept. (G.C.B., D.C., B.K.). Max. figures for organised coastal counts, Clevedon–Portishead: 140, Sept. 5; 86, Oct. 3; and 95, Dec. 5 (P.J.C.). Total of 205, mouth of Avon, Sept. 12

(R.H.P.). Ninety on Marine Lake, Weston-super-Mare, Nov. 10 (H.R.H.L., J.M.L.) and 85 on 16th (T.B.S.). Counts of 164, Sand Bay, Dec. 1 (T.B.S.) and 60, Kewstoke, on 15th (B.C.P.).

Spotted Redshank *Tringa erythropus*

G. Two on Estuary, Sheperdine, on late date of Nov. 17; birds seen, in flight and on mud-banks, by Rev. G. W. H. Moule, who has forwarded conclusive details.

Greenshank *Tringa nebularia*

G. At least six on Estuary, Purton, Oct. 6 (Rev. G. W. H. Moule).

S. The only spring notice is of one, Chew Valley res., May 9 (B.K.). Autumn records from the reservoirs of up to five, Chew Valley, various dates, July–Sept. (B.K.B., R.H.P. *et al.*); up to three, Barrow Gurney, various dates, Aug.–Sept. (P.J.C., A. G, Dixon); and single birds, Cheddar, Sept. 7, Oct. 3 (A. G. Dixon B.K.). Coastal report of two, Sand Bay, Aug. 16 (T.B.S.).

Knot *Calidris canutus*

G. Records include those of 20 on Avon, above Sea Mills, Feb. 2 (A.C.L.); three, Oldbury-on-Severn, Mar. 28 (E.E.D H.F.W.); and six, New Passage, Aug. 29 (H.W.N.).

S. Reported chiefly from Sand Bay, where three seen, Feb. 6, 7 (R.A., T.B.S.) and up to 13, several dates, Aug.-Sept. (R.A.). One, very tame or exhausted, Chew Valley res., Aug. 31 (B.K.B.).

Purple Sandpiper *Calidris maritima*

G. One, Severn Beach, Feb. 28 (W. B. Alexander).

S. One, Brean Down, Feb. 7, 1953 (G. Bright).

Little Stint *Calidris minuta*

G. Two, Severn Beach, Aug. 26 (P.J.C.).

S. One, Chew Valley res., Aug. 11, 15 (B.K.) and two, Sept. 11 (B.K.B.). One, with Grey Plover, on tide-line, Sand Bay, Oct. 30 (R.A.).

Temminck's Stint *Calidris temminckii*

S. Single bird, with two Sanderlings, at water's edge, Chew Valley res., Aug. 29, viewed with telescope at 45 yds. range by R.H.P., who has supplied full and conclusive details; third record for the District (cf. also *Proc. B.N.S.*, 1947, p. 257).

Dunlin *Calidris alpina*

G. About 100 on Avon mud-banks, Sea Mills, Feb. 2 (A.C.L.). Many, probably 1,000, on saltings, New Grounds, Dec. 12 (B.K.).

S. Coastal records of *c.* 500, Sand Bay, Aug. 28 (R.A.) and Weston Bay, Nov. 10 (H.R.H.L., J.M.L.); and *c.* 1,000, Brean Sands, Dec. 30 (W.L.R.). Varying numbers, Chew Valley res., Apr.–July, with max. of 35, May 9 (D.C., B.K.); increase in Aug. to unusually high inland totals of 83 on 3rd (P.J.C., H.H.D., B.K.) and 80 on 7th (G.C.B., S.I.B.).

CURLEW SANDPIPER *Calidris testacea*

S. Single bird identified, Chew Valley res., Sept. 19; third inland record for the District (B.K.).

SANDERLING *Crocethia alba*

S. Coastal reports of 23, Brean Sands, Feb. 14 (P.J.C., B.K.); 20, Sand Bay, May 20 (T.B.S.); and 13, same place, Sept. 11 (R.A.). Inland records of nine, Cheddar res., May 23 (B.K.) and two, Chew Valley res., Aug. 1, 29 (P.J.C., R.H.P.).

RUFF *Philomachus pugnax*

G. Two, evidently wintering, New Grounds, Feb. 10, and eleven, same place, Oct. 2 (H.J.B.).

S. Winter record of three, Blagdon res., Jan. 17 (G.G.C., P.J.C., C.A.L.W., F.W.). Several spring notices from Chew Valley res., where the male of a pair on May 9 was in advanced stage of breeding plumage (B.K.); up to four, same reservoir, various dates, Aug.-Sept. (G. Boyle, S.I.B., R.H.P.). One, mouth of Avon, Sept. 12 (P.J.C., R.H.P.).

AVOCET *Recurvirostra avosetta*

G. Five on Estuary, New Grounds, Aug. 2; three on 11th and five on 13th were doubtless birds of the same party (H.J.B.). First recorded occurrence since that of four seen, apparently in same area, March, 1913 (cf. *Proc. B.N.S.*, 1947, p. 260).

GREY PHALAROPE *Phalaropus fulicarius*

S. One, Cheddar res., Sept. 21 (S. Say per B.K.) and one, probably same, on 26th (B.K.). Winter record from the coast of one, feeding with party of Black-headed Gulls, Clevedon, Dec. 5 (P.J.C.).

GREAT BLACK-BACKED GULL *Larus marinus*

G. Bird found dead, New Passage, July 1, had been ringed as a juvenile, Steep Holm, June 23, 1951 (R.H.P.). Max. winter count, New Grounds—54, mostly ads., Dec. 12 (B.K.).

S. Reservoir records of three, Blagdon, Jan. 24 (P.J.C.); up to five, Cheddar, various dates, Jan.–Apr. (P.J.C., B.K.); and up to five, Chew Valley, several dates, Feb.–Mar. (B.K.). Breeding reported from the Denny (2 miles off Portishead but in county of Monmouthshire), where a pair seen and nest with three eggs photographed, June 4; first record for the island (J.H.S.).

LESSER BLACK-BACKED GULL *Larus fuscus graellsii*

G. Winter count of 32 ads. and one third-year bird on Avon, Cumberland Basin–Sea Mills, Dec. 26 (R.H.P.).

S. One recovered, Ogmore-by-Sea, Glam., Mar. 13, ringed as ad., Steep Holm, Mar. 14, 1953 (R.H.P.). Numbers varying from 20 or 30 to 150 or more, frequently noted, Chew Valley res., Mar.–July (B.K.); observations at dusk, same reservoir, from early Aug. showed that very large numbers were remaining to roost, the following counts being returned : 500, Aug. 3 ; 600 on 19th, and at least 700 on 24th ; 525, Sept. 19 ; 400 or more, Nov. 21, Dec. 17 ; and the quite exceptional winter totals of 630 or more, Dec. 26, and 720 on 28th (P.J.C. and B.K., who record that the birds were almost all adults). Other winter counts of 50 in grassfield, Hinton Blewett, Nov. 28, and 40, Barrow Gurney resrs., Dec. 24 (P.J.C.).

SCANDINAVIAN LESSER BLACK-BACKED GULL *Larus fuscus fuscus*

G. and **S.** Twice reported—one, having deep grey-black mantle, with other gulls, including three typical ads. of *L. f. graellsii*, in car park, Eastville, Bristol, Jan. 31 (R.H.P.) and another with uniformly dark upper-parts, Chew Valley res., May 14 (B.K.) ; both identified as belonging to form *L. f. fuscus*, but these, and other examples recorded in recent years, may perhaps have been birds in intermediate plumage.

HERRING GULL *Larus argentatus*

S. Up to 300, occasionally many more, Chew Valley res., various dates, Mar.–July or later ; birds, mostly immatures, usually at max. strength in late afternoons or evenings (D.C., B.K.). Highest totals—*c.* 600, May 14, and at least 750 at 10.10 p.m. on 20th, when they were evidently remaining to roost ; *c.* 600 at 9.15 p.m., July 13, also appeared to be roosting (B.K.). Recoveries of birds ringed on Steep Holm by R.H.P. include : two, ringed as juvs., 24/6/51 and 10/7/52, recovered Merthyr Tydvil, Glam., and Westbury-on-Trym, Bristol, *c.* 24/6/54 and early Oct./54 respectively ; one ringed as ad., 6/10/53, recovered in "crow's nest" of the "Ivor Isobelle", Barry Docks, 5/3/54 ; and two, ringed as ads., 17/3/53 and 17/3/54, recovered near Taunton, 23/10/54, and Aberthaw, Glam., 1/8/54 respectively.

GLAUCOUS GULL *Larus hyperboreus*

G. Two, third year birds or older, New Grounds, Dec. 17 (H.J.B.).

ICELAND GULL *Larus glaucoides*

G. and **S.** One, identified as a fourth year bird, with Herring Gulls, on Avon, nr. Bedminster Bridge, Bristol, several occasions, Mar. 1–4, and a first year bird, with Herring and Black-headed Gulls, Barrow Gurney resrs., Dec. 26 ; reported by P. J. C., who, in both cases, has supplied conclusive details.

BLACK-HEADED GULL *Larus ridibundus*

S. Large numbers, Chew Valley res., frequent intervals, Feb. to end of year ; peak totals of up to 900 or more, Mar.-Apr., and of *c.* 1,000, mid-Dec. ; observations at dusk on various dates showed that many were staying to roost (P.J.C., H.H.D., B.K. *et al.*). Inconclusive evidence of successful breeding, same place, June 2, when two pairs under close observation, and empty nest found (P.J.C.). A count, on Dec. 12, of birds flying in to roost on mud-banks at mouth of Avon yielded a total (*c.* 15,500) almost identical with that obtained in Jan., 1953 (cf. *Proc. B.N.S.*, 1953, p. 398) (P.J.C.).

SABINE'S GULL *Xema sabini*

S. Adult in breeding plumage seen, and photographed, at close range off Old Pier, Weston-super-Mare, Aug. 12 (H.R.H.L., J.M.L.) (cf. *Brit. Birds*, XLVIII, p. 83).

KITTIWAKE *Rissa tridactyla*

G. Second-year bird, evidently storm driven and ailing, on mudbanks, Sea Mills, Nov. 26 (R.H.P.).

S. Ad. found dead, mouth of Avon, Mar. 14 (R.H.P.). Immature bird, in poor condition, flying off Tower Rock, Steep Holm, and later seen on cliff ledge, Apr. 5 (D.M.C., P.J.C., R.S.C. *et al.*). Three ads. and an immature flying over sprat nets, Weston-super-Mare, Nov. 28 (R.H.P.). Other coastal records : seven ads and a second-year bird in flight, Clevedon–Portishead, Dec. 5 (P.J.C.) ; single ads. dead, Weston-super-Mare, Dec. 15, 16 (H.R.H.L., J.M.L.) ; and four dead, Sand Bay, Dec. 25 (T.B.S.). Six ads., Cheddar res., Dec. 5 (B.K., N.W.) and up to six ads. and immatures (some dead) reported from same place, frequent intervals, Dec. 8–31 (K.M.C., H.H.D., W.L.R., F.W. *et al.*). Single birds, Chew Valley res., Dec. 12, 18 (B.K.B.).

BLACK TERN *Chlidonias niger*

G. Exceptional numbers in Severn Estuary on spring passage—292 being counted over period of three hours flying up-river off Sheperdine, May 9 (R.H.P.) ; *c.* 50 over mud-banks, New Grounds, same date (H.H.D., G. Waterston) and half a doz., June 8 (H.J.B.). Autumn records of up to seven, New Grounds, various dates, Aug.–Oct. (H.J.B.).

S. Unusually high numbers also occurred at the reservoirs in spring, and again on autumn passage. Two reported from Cheddar, Apr. 25 (B.K.) and six, May 8 (W.L.R.). Ten seen, Blagdon, May 9 (W.T.P., C.A.L.W.) and 91 counted during the morning at Cheddar, while at Chew Valley 90 were seen (perhaps some from Cheddar) on evening of same day (G. Boyle, B.K.). Noted, generally in small or moderate numbers, Blagdon, Cheddar and Chew Valley, frequent intervals, early Aug. to mid-Oct. or later (various observers) ; exceptional count of 170, Chew Valley, on evening of Aug. 5 (P.J.C., B.K.), and other noteworthy totals from same place of 40, Aug. 27 (B.K.B.) and 34, Sept. 6 (D.C.). Two records only for Barrow Gurney—five, Aug. 26 and four on 28th (G.E.C., A. G. Dixon).

COMMON TERN *Sterna hirundo* ARCTIC TERN *Sterna macrura*

G. Common (or Arctic) Terns reported from the Estuary, May 9, when 61 counted flying up-stream off Sheperdine (R.H.P.); one or two off New Grounds, same date (H.H.D.).

S. Frequently noted, Commons or Arctics, at the reservoirs on both passages. Max. totals—22, Cheddar, May 9 (B.K.); 27 or more, Blagdon, Sept. 26, 27 (B.K.B., G.C.B.); and 55 high overhead, Chew Valley, Oct. 3 (B.K.). Most birds probably Commons, but up to three Arctic Terns definitely identified, Cheddar, various dates, Aug.–Sept. (G.G.C., P.J.C., B.K., E. G. Richards *et al.*).

Roseate Tern *Sterna dougalli*

S. One, Cheddar res., May 5–7, was compared with nearby Common (or Arctic) Terns and clearly identified; bird—seen in flight and at rest, sometimes at extremely close range—attracted attention by the characteristic " aak aak " call; white appearance of upper parts; unusually long tail streamers; and the noticeably pink flush on breast (G. Boyle, B.K., E.M.P. *et al.*). First record for the District for nearly sixty years (cf. *Proc. B.N.S.*, 1899, p. 96; 1947, p. 261). See also *Rep. Som. Birds*, 1954.

Little Tern *Sterna albifrons*

G. One on Estuary, Sheperdine, May 9 (R.H.P.) and party of 15 flying downstream, Purton, Sept. 27 (Rev. G. W. H. Moule).

S. Single birds, Cheddar res., Apr. 25, and Chew Valley res., May 2 (B.K.).

Stock Dove *Columba oenas*

S. Nest with four eggs (normal clutch two), Chewton Keynsham, Apr. 25 (G. Bright).

Cuckoo *Cuculus canorus*

G. Calling, Mangotsfield, as late as July 2 (D.M.C., R.S.C.) and Little Stoke on 4th (H.H.D.).

S. Still calling, Long Ashton, July 1 (G.E.C.) and Hutton on 2nd (W.L.R.).

Barn Owl *Tyto alba*

S. Noted more frequently than in recent years. One, sometimes two, Blagdon, various occasions, Jan.–Mar. and Nov. (P.J.C., T.B.S.). Single bird, Burrington, Oct. 30 (P.J.M.N.) and one or two, Chew Valley, late Dec. (P.J.C.). Reported from Brean Down—single bird, Feb. 20, Dec. 27 (T.B.S.) and perhaps three, Mar. 18 (W.L.R.).

Short-eared Owl *Asio flammeus*

S. One quartering ground near Priddy Pool, Mendip, Sept. 18 (A. G. Dixon).

Nightjar *Caprimulgus europaeus*

G. Heard, Bournstream, North Nibley, July 23 (H.F.W.).

S. One on arm of garden chair, Saltford, May 15 (B.K.).

SWIFT *Apus apus*

G. Late dates—three, Wotton-under-Edge, Sept. 7 (H.F.W.) and one, Mangotsfield on 9th (D.M.C., R.S.C.).

S. Enormous number over the water, Chew Valley res., several dates, second half of June, with estimated total of *c.* 2,000 on 27th; at least 1,000, same place, Aug. 2, but less than 100 on 3rd (B.K.).

KINGFISHER *Alcedo atthis*

G. Pair, Iron Acton, Apr. 14 (R.S.C.). Single birds, Bitton, June 7 (R.S.C.); Littleton-on-Severn, June 26 (A.C.L.); and over the Estuary, New Grounds, Sept. 19 (P.J.C., H.H.D.).

S. Frequently seen, Blagdon, Cheddar, Chew Valley and Litton resrs. (various observers). Single birds, Banwell, Jan. 5 (W.L.R.); Wick St. Lawrence, Aug. 14 (T.B.S.); and mouth of Avon, Sept. 12 (P.J.C.).

HOOPOE *Upupa epops*

S. One feeding on a lawn, Ubley, May 2 (G. Lowther) (cf. *Evening Post*, May 7).

LESSER SPOTTED WOODPECKER *Dryobates minor*

G. Single birds, Wotton-under-Edge, Apr. 23, 29, and two, May 24 (H.F.W.). One frequently seen drumming on metal top of electricity pole, Iron Acton, in May (Dr. J. H. Naish).

S. One, Saltford, June 20 (B.K.) and Blagdon, July 11 (P.J.C.). Pair feeding young, Stanton Drew, June 9, 1953 (G. Bright).

WRYNECK *Jynx torquilla*

S. Female found dead, Wrington, Aug. 23, and sent to City Museum (per P.F.B.). One, evidently a bird of the year, trapped and ringed, Long Ashton, Aug. 31 (G.E.C., R.H.P.).

WOODLARK *Lullula arborea*

G. Fewer than usual in Dursley area; only record—two, Mar. 27 (D.R.H.). Pair, Nibley Hill, throughout breeding season; four, same place, Sept. 5 (H.F.W.).

S. Breeding season records from Cheddar, Compton Bishop, Crook Peak, Failand, Shipham and Sidcot (G.E.C., C. H. Fry, P.J.M.N. *et al.*). One, Brean Down, Jan. 28 (W.L.R.). Twelve, Worlebury Hill, Nov. 28 (H.R.H.L., J.M.L.).

SAND MARTIN *Riparia riparia*

S. Colony of *c.* 20 pairs, several holes still containing young and some juveniles seen in flight, in sand cutting, Chew Valley res., Sept. 19; cutting subsequently filled in (R.H.P.).

GOLDEN ORIOLE *Oriolus oriolus*

G. Two first summer males visited Littleton-on-Severn brickworks in second week of June and remained at least three weeks, being seen or heard, usually in withey trees, by various observers.

Brief views obtained and characteristic " weela-weeo " call heard, probably from both birds, on 26th (H.D., H.H.D., T. Jones *et al.*), while on 27th A.E.B. and H.H.D. saw them extremely well in adjoining hedgerow trees. Conclusive evidence on 29th that both were, in fact, giving the whistling call (J. B. Boutflower per R.V.C.). Birds first noticed by brickwork's employees, June 11, and last seen July 2 (T. Hucker).

S. Ad. male seen and heard in oak trees near Ranger's cottages, Leigh Woods, on morning of May 22 (C. Baker) and in the evening (same observer and B.K.), when clear views obtained and both screeching note and characteristic whistling call heard ; still present on following morning (R. Cavill) but not reported subsequently.

RAVEN *Corous corax*

S. Five young reared, Brean Down (W.L.R.). Bred, Sand Point, but eyrie, at unusually low level, destroyed by high spring tide, May 4 ; two partly fledged young rescued and hand reared by local boys (W.L.R.). Pair, Steep Holm, Apr. 3–6 and Sept. 4, but no young seen (P.J.C.).

BLUE TIT *Parus caeruleus*

S. Exceptional movement reported from Long Ashton, last week of Feb., when 30 caught and ringed in a garden trap on 25th and a further 40 taken in same trap, 27th/28th, but rapid decrease thereafter (M.A.W.). One, Steep Holm, Apr. 3, but none seen on three following days or on Sept. 4 (P.J.C., R.H.P.). Seven arrived at point of Brean Down on morning of Oct. 10, coming in from direction of Steep Holm (B.K.B., H.D. *et al.*).

WILLOW TIT *Parus atricapillus*

G. One in hedgerow, Little Stoke, Dec. 24, and again near same spot on 27th ; plumage details and characteristic nasal call clearly noted (D.M.C., R.S.C., H.H.D.).

DIPPER *Cinclus cinclus*

G. Pair present on R. Boyd, Wick, throughout year (D.R.H.).

S. Pair bred, but nest finally deserted, Monkton Combe (A. G. Dixon). Nest with eggs, Stanton Drew, Apr. 18, 1953 (G. Bright).

RING OUZEL *Turdus torquatus*

G. Two, Stinchcombe Hill, Apr. 24, and one, probably first winter bird, Sept. 25 (D.R.H.).

S. One near Cadbury Camp, Apr. 24 (R.G.H.) and one, female, Compton Bishop on 25th (P.J.M.N.). Male, Brean Down, Apr. 18, 1953 (G. Bright).

WHEATEAR *Oenanthe oenanthe*

S. Noted in various Mendip localities but nesting again reported only from Wavering Down, Compton Bishop, where two pairs bred successfully (P.J.M.N.).

STONECHAT *Saxicola torquata*

S. Breeding reported only from Brean Down (W.L.R. *et al.*) but pairs frequently noted in autumn and winter—chiefly in coastal areas and at Chew Valley res. (various observers).

BLACK REDSTART *Phoenicurus ochrurus*

S. Two, females or immatures, Brean Down, Jan. 31 ; ad. male and a female or immature, same place, mid-Nov. (E. G. Holt).

GRASSHOPPER WARBLER *Locustella naevia*

G. Heard in breeding season nr. Wotton-under-Edge, and at Inglestone Common, nr. Wickwar ; Mangotsfield ; and Wick (R.S.C., D.R.H., H.F.W. *et al.*).

S. Breeding season records from Kenn Moor (R.A.) ; Leigh Woods and Rowberrow Plantation, nr. Churchill (P.J.C.).

WHITETHROAT *Sylvia communis*

G. Date of bird trapped Mangotsfield in previous year (cf. *Proc. B.N.S.*, 1953, p. 401) should read Oct. 16.

LESSER WHITETHROAT *Sylvia curruca*

S. More plentiful than for several years in Long Ashton, Combe Down and Saltford areas (G.E.C., B.K.).

WOOD WARBLER *Phylloscopus sibilatrix*

G. Six pairs probably breeding in suitably wooded area of 9¾ sq. kms. nr. Dursley (D.R.H.) but only six singing males recorded —3 each, Berwick and Blaise Woods—in 143 sq. kms. (*c.* 5 sq. kms. woodland) of south-west Glos. (survey by 17 observers).

S. Ten singing males, Leigh Woods (in area of *c.* 1 sq. km.), May 20 (P.J.C.). At least four, Combe Down, May 9 (A. G. Dixon).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. Single male, Elberton, Apr. 25 (A.E.B.).

ROCK PIPIT *Anthus spinoletta petrosus*

G. and **S**. Well distributed in autumn and winter (presumably this race) on Estuary and along Avon as far as Hotwells. On Glos. side sixteen counted along Severn bank, Littleton to Oldbury, Nov. 7 (R.H.P.).

GREY WAGTAIL *Motacilla cinerea*

S. One in flight over Steep Holm, Sept. 4 ; first record for the island (G.E.C., P.J.C., R.H.P.).

YELLOW WAGTAIL *Motacilla flava flavissima*

G. Breeding or breeding season records from Mangotsfield (R.S.C.) and Berkeley Pill, Chipping Sodbury, Elberton, Hambrook, Rangeworthy and Westerleigh (R.H.P.).

S. Single bird, Barrow Gurney resrs., on late date of Oct. 23 (M.A.W.) (cf. also *Proc. B.N.S.*, 1951, p. 252).

[BLUE-HEADED WAGTAIL *Motacilla flava flava*

G. Four birds with *c.* 35 *M. f. flavissima* on foreshore, Severn Beach, Apr. 23, probably of this form ; reported by W.A.H. and J. A. F. Wilkins who record that " blue-grey heads with white eyestripes and chins made them easily distinguishable from Yellow Wagtails."

S. Probable record of one, a male, Saltford sewage farm, May 15, 18 (P.J.C., B.K.) (see *Rep. Som. Birds*, 1954).]

RED-BACKED SHRIKE *Lanius collurio*

S. Breeding reported from Cheddar (N.W.) and Monkton Combe (A. G. Dixon). Pair, Combe Down, Bath, May 15, 19 (J. R. Fairbank per B.K.).

STARLING *Sturnus vulgaris*

G. Large numbers, perhaps 15,000 or more, roosting in dense thorn scrub, nr. Frenchay, Sept. to early Nov. (R.H.P.).

HAWFINCH *Coccothraustes coccothraustes*

G. Two, Westridge Wood, N. Nibley, Jan. 31 (H.F.W.) and two, Tortworth, Nov. 28 (M. A. Tullock per H.F.W.).

SISKIN *Carduelis spinus*

G. Party of *c.* 15 in alders, Wotton-under-Edge, Jan. 5 (H.F.W.). Three, Tortworth, Dec. 7 (M. A. Tullock per H.F.W.).

S. About 20, Hutton, Mar. 20 (W.L.R.).

LESSER REDPOLL *Carduelis flammea cabaret*

G. Party of eight, Wotton-under-Edge, Mar. 8 (H.F.W.).

BULLFINCH *Pyrrhula pyrrhula*

S. Reported from various widely separated localities as being noticeably more plentiful than usual (G.E.C., P.J.C. *et al.*).

CROSSBILL *Loxia curvirostra*

S. Small party of six, nr. Wrington, Jan. 11 (E. G. Holt).

CORN BUNTING *Emberiza calandra*

G. Reported in breeding season from Kingscote (M.A.B., D.R.H.) ; Downend (R.H.P.) ; Iron Acton (R.S.C.) ; main road, Little Sodbury–Hawkesbury Upton (R.H.P.) ; Mangotsfield (D.M.C. *et al.*) ; and at Marshfield, where substantial increase noted—18 singing males being located in limited area, July 18 (P.J.C.).

S. Has increased, Saltford (Golf Course area), where three males in song, May 13 (B.K. *et al.*). Up to four, Yoxter, Mendip, various dates, July–Aug. (P.J.C., C. H. Fry).

CIRL BUNTING *Emberiza cirlus*

G. Singing bird, Penpole Point, Shirehampton, July 22 (P.J.M.N.).

S. Bred, Bleadon (R.A.) and Sidcot (C. H. Fry); breeding season records from Cheddar (B.K.), Failand (P.J.C.) and Loxton (G.E.C.).

House Sparrow *Passer domesticus*

S. One, female or immature, seen to alight at point of Brean Down, Oct. 10, flew in from the Channel, apparently from direction of Steep Holm (G.E.C., P.J.C., H.D.).

Tree Sparrow *Passer montanus*

G. Breeding season records from Little Sodbury—four ads, Apr. 25 (D.M.C., R.S.C.) and Mangotsfield—five ads., May 13 (R.S.C.). Nest with six young in apple tree, Tockington, June 4 (A.E.B.).

S. Winter records include that of a party of seven found roosting on rafter supporting overhang of outbuilding roof, Saltford Sewage Farm, on two occasions in Dec. (B.K.).

LEPIDOPTERA NOTES BRISTOL DISTRICT. 1954

By C. S. H. Blathwayt, M.A., F.R.E.S.

(*Read in title to council, May 5, 1955. Received Feb. 2, 1955*)

AFTER an exceptionally cold spell at the end of January and the beginning of February the weather improved to a certain extent and the latter part of March and April were comparatively fine. May was a moderate month only so far as weather was concerned and was followed by the wettest summer and autumn for many years.

On the whole the year was a bad one so far as the Lepidoptera were concerned and particularly for migrating species.

I am most grateful to Messrs. C. L. Bell (C.L.B.), Dr. A. M. Campbell (A.M.C.), G. H. W. Cruttwell (G.H.W.C.), H. S. Damsell (H.S.D.), Dr. G. Hartill (G.H.) and R. Henderson (R.H.) for sending me their records, some of which are included below with a selection from my own records (C.S.H.B.).

Euphydryas aurinia Rott. (Marsh Fritillary). Larvae at Wickwar, Feb. 28, (C.L.B.).

Limenitis camilla Linn. (*sibylla* Linn.) (White Admiral). Larvae at Wickwar, May 13, (R.H.).

Callophrys rubi Linn. (Green Hairstreak). Var. with ochreous hindwings. Frome, May 8, (G.H.W.C.).

Mimas tiliae Linn. (Lime Hawk). First seen May 8, (C.L.B.). One brick red var. at light, Bristol, (H.S.D.).

Acherontia atropos Linn. (Death's-head Hawk). One larva taken at Hambrook (Glos.), Aug. 15, (per G.H.).

Cerura hermelina Goeze (*bifida* Hubn.) (Poplar Kitten). Two males at light early June, Bristol, (H.S.D.) : another at Weston, June 28, (C.S.H.B.).

Stauropus fagi Linn. (Lobster Prominent). One at light, June, Bristol, (H.S.D.) : also at Weston, (C.S.H.B.).

Clostera curtula Linn. (Large Chocolate-tip). May, June and August at light, Bristol, (H.S.D.) ; Cleeve, (A.M.C.) ; Weston, (C.S.H.B.).

Tethea ocularis Linn. (*octogesima* Hubn.) (Figure of Eighty). Fairly common in June at light, Bristol, (H.S.D.).

Lymantria monacha Linn. (Black-arched Tussock). August, at light, Weston, (C.S.H.B.).

Pseudoips bicolorana Fuessl. (*quercana* Schiff.) (Scarce Silver-lines). At light, Weston, July-August, (C.S.H.B.).

Eilema complana Linn. (Scarce Footman). Fairly common at light, Weston, July-August, (C.S.H.B.).

Apatele leporina Linn. (Miller). One at light, Bristol, July, (H.S.D.). One at rest, Shapwick, Aug. 2, (C.S.H.B.).

Agrotis trux Hubn. (*lunigera* Steph.) (Crescent Dart). Several at light, Weston, July, early Aug., (C.S.H.B.).

Amathes glareosa Esp. (Autumnal Rustic). At light Weston, Sept. 4, (C.S.H.B.).

Eurois occulta Linn. (Great Brocaded Rustic). At light, Frome, Aug. 24, (G.H.W.C.).

Polia nitens Haw. (*advena* auctt.) (Pale-shining Arches). At sugar, Shapwick, June 19, (C.S.H.B.).

Hadena suasa Schiff. (*dissimilis* Knoch) (Dog's-tooth). At sugar, Shapwick, June 19, (C.S.H.B.).

Hadena bombycina Hufn. (*glauca* Hubn.) (Glaucous Shears). At light, Weston, May 13, (C.S.H.B.).

Eumichtis adusta Esp. (Dark Brocade). At light, June, Bristol, (H.S.D.).

Eumichtis lichenea Hubn. (Feathered Ranuncule). Common at light, September, Weston, (C.S.H.B.).

Bombycia viminalis Fabr. (Minor Shoulder-knot). At light, Shapwick, July, (C.S.H.B.).

Procus literosa Haw. (Rosy Minor). North Somerset Coast on Ragwort, Aug. 2. (C.S.H.B.).

Brachionycha sphinx Hufn. (Common Sprawler). Several at light, Weston, November, (C.S.H.B.).

Leucania pudorina Schiff. (*impudens* Hubn.) (Striped Wainscot). Fairly common Shapwick and Clevedon, June, (C.S.H.B.).

Zenobia retusa Linn. (Double Kidney). At light, Shapwick, July 31; Weston, Aug. 23, (C.S.H.B.).

Orthosia populeti Treits. (Lead-coloured Drab). Fairly common at sallow, Clevedon in late March and early April, (C.S.H.B.).

Dasycampa rubiginea Fabr. (Dotted Chestnut). At Ivy. near Glastonbury, Oct. 23, (C.S.H.B.).

Lithophane socia Rott. (Pale Pinion). At Ivy, Weston, and near Glastonbury, Oct., (C.S.H.B.).

Cucullia chamomillae Schiff. (Chamomile Shark). At light, Frome, May 13, (G.H.W.C.).

Brephos parthenias Linn. (Common Orange-underwing). Several at Clevedon in late March, (C.S.H.B.).

Brephos notha Hubn. (Light Orange-underwing). Common around Aspen at Clevedon, late March and April, (C.S.H.B.).

Sterrha dilutaria Hubn. (*holosericata* Dup.) (Silky Wave). A few on Durdham Down, Bristol, July 10, (H.S.D.).

Lobophora halterata Hufn. (Large Seraphim). At light, Frome, May 29, (G.H.W.C.). At rest Clevedon, June 7, (C.S.H.B.).

Thera variata Schiff. (Grey Spruce Carpet). At Ivy, near Glastonbury, Oct., (C.S.H.B.).

Lampropteryx otregiata Metc. (Metcalfe's Carpet). At light, near Glastonbury, July 31, (C.S.H.B.).

Discoloxia blomeri Curt. (Blomer's Rivulet). Fairly common at light, June and early July, Weston, (C.S.H.B.).

Perizoma bifaciata Haw. (*unifasciata* Haw.) (Barred Rivulet). At light, Weston, Aug. 16, (C.S.H.B.).

Hydriomena ruberata Frey. (Ruddy Highflyer). At light, Weston, early June, (C.S.H.B.).

Nyctosia obstipata Fabr. (*fluviata* Hubn.) (Narrow-barred Carpet). At light, Weston, May 29, (C.S.H.B.).

Eupithecia fraxinata Crewe (Ash Pug). Several at flowers, North Somerset Coast, June and September, (C.S.H.B.).

Angerona prunaria Linn. (Orange Thorn). At Wickwar, July 10, (R.H.).

Apocheima hispidaria Fabr. (Small Brindled-beauty). A male at rest, Feb. 20. Several at light, March 6, near Glastonbury, (C.S.H.B.).

Margaronia unionalis Hubn. (Scarce Olive-tree Pearl). One at light, Weston, Oct. 18, (C.S.H.B.).

Hepialus hecta Linn. (Golden Swift). Common at Clevedon, June 26, (C.S.H.B.).

Hepialus sylvina Linn. (Wood Swift). At light, Weston, August, (C.S.H.B.).

SOME RESULTS OF MARKING GULLS ON STEEP HOLM

By R. H. Poulding

(*Read in title to Council, May 5, 1955. Received February 28, 1955*)

Introduction

SINCE 1946 a number of visits have been made to Steep Holm for the purpose of marking gulls, resulting in the ringing of 1,714 individuals of the three breeding species, Great Black-backed Gull (*Larus marinus*), Lesser Black-backed Gull (*L. fuscus*) and Herring Gull (*L. argentatus*). This paper summarises the 119 recoveries reported to the British Trust for Ornithology during the eight year experimental period to the end of 1954, and the 104 sight records obtained of plastic-marked birds. Owing to the wide variation in the numbers ringed from year to year, to the diversity of ring patterns used, and to a previously unsuspected high ring loss, giving an undue bias in the recovery percentage for first year birds, detailed statistical treatment of these returns is avoided. For convenience, the term ‘ nestling ’ is used to include the pre-flight stages of downy-young and fledgling-juvenile.

Landsborough Thomson (1924) in his summary of the recoveries of Herring and Lesser Black-backed Gulls ringed as nestlings in the north of Scotland and in the north of England, concludes that the former species tends to wander southwards in autumn within the limits of the British Isles but the latter migrate southwards along the coasts of France, Spain and Portugal to reach the Mediterranean and North Africa. From more complete information based on the recoveries of British ringed birds, Witherby *et al.* in *The Handbook* (1938-41) state that the Herring Gull is more or less sedentary but there is a tendency to disperse in any direction. The majority do not move further than 200–300 miles although a few have reached northern France from colonies in the north of England. The 19 recoveries of Herring Gulls ringed as nestlings on Lundy (N. Devon), published by the Lundy Field Society (1946–53), include one from N. France (Finistère). *The Handbook* suggests that the Great Black-backed Gull is probably largely sedentary but some show dispersal movements and some migrate.

Recoveries from Pembrokeshire show that a few reach Cornwall, N.W. and W. France and N. Spain in their first winter.

Lying in the Bristol Channel, five miles from Lavernock Point (Glam.) and three miles from the tip of Brean Down (Som.), Steep Holm serves both as a breeding site and as a roost outside the breeding season. No recent estimates have been made of the breeding population but counts in 1949 suggested that there were 1,250 pairs of Herring Gulls, 750 pairs of Lesser Black-backs and 33 pairs of Great Black-backs. Since then the former species has continued to displace the Lesser Black-backs from the once flourishing colonies on the plateau and the Great Black-backs have increased to 40 pairs or more. Maximum numbers at roost appear to be reached from January to March after which the island is abandoned by non-breeders until the early autumn. There is a considerable interchange between populations in feeding areas linked with roosts at the Avon estuary (Som.), the estuary of the Taff (Glam.) and Steart Island (Som.), and other dispersive systems in Somerset and South Wales which use Steep Holm as a central roost. These dispersive systems lie in the main within a circle of 25 mile radius centred on Steep Holm. Gulls recovered outside this area, referred to later as the local dispersive zone, are considered to have shown movement away from Steep Holm and related dispersive systems.

METHODS

Details of the coloured plastic bands employed on nestlings have previously been given (Poulding, 1951). By this method 358 Herring Gulls and 74 Lesser Black-backs received a colour band in addition to the numbered aluminium ring on the opposite leg. Serial numbers, 1 cm. in height, were placed on the plastic rings used on Herring Gulls in 1952.

Butt-end type aluminium rings as supplied by the B.T.O. were at first used for Herring and Lesser Black-backs but were later replaced by clip rings normally placed on Great Black-backs. In 1954, a stronger butt-end ring, constructed from S.W.G. 16 aluminium strip, was introduced for the more permanent marking of adults. During 1953 and 1954 ten adult Herring Gulls were dyed on the upper-parts and tail with rhodamine in 30 per cent. alcohol.

To conserve rings, the more advanced nestlings were usually selected for marking, and to minimise errors arising from the confusion of the two species, nestling Herring Gulls were largely marked on the steeper slopes where this species predominated. Most of the adults and immatures were taken at night with the aid of strong torches and smaller numbers were caught by rocket net (14), and by chance captures.

Recoveries of Great Black-backed Gulls

Of the 58 Great Black-backs marked, 48 were nestlings, nine adults and one a third year bird. So far, six (10%), all ringed as nestlings, have been recovered ; five occurred within the local dispersive zone and one in France. One was found dead on Steep Holm shortly after ringing ; one reported from Uphill (Som.) 10 days after ringing ; another caught in fishing nets at Weston-super-Mare in the following November and one was shot on the coast at Stolford, near Bridgwater in its second summer. One in its third summer was found on the bank of the River Severn at New Passage (Glos.). The remaining return was reported from Finistère, N. France (200 miles S.W.) in November, 16 months after ringing.

Recoveries of Lesser Black-backed Gulls

The marking of 223 nestlings and 26 adults yielded 13 (5.2%) recoveries, consisting of 10 from the former and three from the latter. Four of the nestlings were found dead on Steep Holm shortly after ringing, two were reported from Brean sands (Som.), one and two months later, and another was recovered at Southampton (Hants.) at the end of August—seven weeks after ringing. The three remaining returns of nestlings were reported from abroad during their first year. These are listed in Table 1.

TABLE I

Lesser Black-backed Gulls ringed as Nestlings in June or July and recovered Abroad

Number	Recovery date	Place recovered	Distance from Steep Holm
AD 2335	5.12.46	Portimao, Portugal	1,000 miles
AD 3434	4.12.48	Oporto, Portugal	800 ,,
408912	–. 5.53	Olhao, Portugal	1,000 ,,

The three recoveries of adults trapped in March or April occurred in the local dispersive zone during subsequent breeding seasons. One was found dead near Cardiff (Glam.) two years and three months after ringing ; one was reported from Ogmore-by-Sea (Glam.) and another from Kingston Seymour, near Clevedon (Som.), both twelve months later.

Seventy-four nestlings were marked with red plastic rings in 1949 and nine visual records were later obtained. The first colour marked juvenile was seen along the New Cut, Bristol, in the first week of the following September, and two, possibly three, frequented this stretch of the Avon and the dock area until the end of October, the last being recorded on the 27th. One was reported from Barrow Gurney Reservoirs in September.

Recoveries of Herring Gulls

The 100 recoveries (7%) obtained from the ringing of 1,401 Herring Gulls give a more detailed picture of the distribution of this species, particularly of the initial juvenile dispersal, than the few returns permitted for the preceding species. Of the total marked, 973 were nestlings with a return of 8.2% (80), 67 were in the age groups 1–4 years when caught, no recoveries of which have so far been reported and 361 were adults yielding a return of 5·5% (20). Ninety-two visual records have been received of plastic-marked gulls, many of which refer to the same individuals reappearing in the same localities.

Herring Gulls marked as nestlings.

Of the 80 recoveries of Herring Gulls marked as nestlings, 73 (91%) were returned in the first year of life calculated from July 1 following hatching. Paynter (1947) in his analysis of 1,252 recoveries of the American Herring Gull (*L. a. smithsonianus*) ringed on Kent Island (Mass.) gives 51.9% (650) as recovered in the first year of life commencing from the time of hatching. Similar figures given by Paludan (1951) suggest a first year recovery rate of 64.5% based on 966 recoveries from Danish ringed Herring Gull chicks, but in order to avoid the high percentage of recoveries from chicks found dead in gulleries, he calculated the first year from September 1. When corrected in this way, i.e. taking September 1 as the commencement of the first year, the recovery rate for Steep Holm ringed chicks is reduced to 86%. This abnormally high first year recovery percentage may be due to a large proportion of the ringed gulls losing the ring by direct removal or corrosion (Poulding, 1954) resulting in fewer recoveries in later years.

TABLE II

Distribution of Recoveries of Herring Gulls ringed as Nestlings

	Within the Local Dispersive Zone					Outside the Local Dispersive Zone	
Interval after ringing	Steep Holm	Som.	Glos.	Glam.	Mon.	England and Wales	France
0–3 months	21	28	–	7	–	1	–
3–6 months	–	1	3	1	–	1	–
6–12 months	2	3	1	2	1	–	1
1–5 years	1	1	1	1	–	2	1

The distribution of recoveries at various time intervals in relation to the local dispersive zone is shown in Table II. The majority occurred on or near the coast, exceptions being several from the Bristol area and one in its third summer found dead near Merthyr Tydfil (Glam.), 20 miles inland. Gulls found dead on Steep

Holm shortly after ringing, or later found as skeletons, were presumed never to have left the island and are included in the 0–3 months interval after ringing. Two first year birds, partially decomposed, were found at a roosting site on the island in the March following ringing, and a worn, recently discarded ring placed three years previously on a nestling, was found also in March in a similar position. It is noteworthy that 28 of the returns in the initial three months dispersal period occurred along the Somerset coast as compared with seven from Glamorgan. This apparent preference for the former may be due to its closer proximity to the island and not to tidal movements which, off Steep Holm, are to the north-east or south-west. Nineteen of the 28 Somerset recoveries in this period occurred on the Brean and Weston-super-Mare coast adjoining Brean Down, the nearest point on the mainland to the island.

Subsequently to the initial dispersal phase, recoveries from the Welsh side of the Bristol Channel included single returns from Aberthaw, Barry (Glam.), Newport (Mon.) and three from Cardiff (Glam.). Returns from the Somerset side included one from Bridgwater, one from Lympsham, near Weston-super-Mare, two from near Portishead and three from Avonmouth (Glos.). Inland records from the Bristol area included returns from the Bristol Docks (2), Westbury-on-Trym (1) and a Dundry housing estate (1). No recoveries of gulls more than five years after ringing have so far been reported.

Six Herring Gulls, 7.5% of the recoveries from ringed nestlings, show a movement extending beyond the local dispersive zone ; four were recovered from the South Coast of England and two from France. These are listed in Table III. In addition, a plastic marked Herring Gull was seen at Ilfracombe, N. Devon, early in the November following ringing.

TABLE III

Herring Gulls ringed as Nestlings and recovered outside the Local Dispersive Zone

Number	Date ringed	Date recovered	Place of recovery
AN 9987	28.6.49	22.9.49	Berry Head, S. Devon
408956	8.7.52	4.12.52	Devonport
AD 2333	30.6.46	1.8.49	Weymouth, Dorset
407703	18.6.50	21.11.53	Brighton, Sussex
406829	26.6.49	–.11.50	St. Vaast-la-Hougue, Marche, N. France
408879	10.7.52	8.1.53	Roz-sur-Couesnon, nr. Dol, N. France

These records indicate a small southward movement away from the local dispersive zone, probably confined to a coastal movement around the south-western peninsula to the South Coast, and thence to N. France. The recoveries from Weymouth (Dorset) and Brighton (Sussex) of birds in their fourth year, suggest that Herring Gulls, showing this tendency to move away, may not return to breed, but remain attached to more distant groups. It is interesting to note that these distant recoveries have all occurred south of the local dispersive zone. The two recoveries from France have been accepted by the Bird Ringing Committee but a third, near the Gironde estuary in its second winter, has been rejected on the grounds that it is outside the known southern limit of movements of British ringed Herring Gulls, and was, in all probability, a Lesser Black-back.

Of the 92 visual records obtained from plastic-marked nestlings all, except the one reported from Ilfracombe, occurred within the local dispersive zone. Most of these records came from the docks and adjoining river in the centre of Bristol where a number of observers made regular searches for these birds. The highest concentration reported was of three among 60 first winter Herring Gulls feeding along the New Cut in the November following marking. Plastic marked gulls in all stages of immaturity, from juvenile to adult, have frequently been observed in this stretch of the River Avon. Since it was first noticed in the November following ringing, a gull marked with green plastic has been seen regularly in the same river stretch for three years. Colour marked gulls have also been reported from Cardiff and Barry (Glam.), Chepstow (Mon.), Weston-super-Mare, Barrow Gurney and Cheddar reservoirs (Som.), Avonmouth and Steep Holm. An immature was seen with roosting gulls on Steep Holm in the April following marking and another in adult plumage was seen at the same place in March, nearly four years after marking.

Herring Gulls ringed as adults.

Twenty (5.5%) of the 361 adults marked have so far been recovered ; ten were retrapped on Steep Holm at the commencement of the breeding season a year later ; nine occurred within the local dispersive zone and one beyond. The latter return was reported from Pendine Sands (Carm.), 50 miles to the north-west, nearly three years after marking. This is the only recovery from any of the three species which indicates any tendency to move in a northerly direction outside the local dispersive zone.

Of those occurring within the local dispersive zone, two were reported from Glamorgan (Barry and Aberthaw), one from Monmouth, five from Somerset, and one from the Bristol Docks. Four of the Somerset returns were reported from the Weston area and one was reported from Luxhay Reservoir, near Taunton, 15 miles inland.

Sight records of dyed adults were reported from the Brean Down area in April, from Edington Burtle and Westhay (mid-Somerset) and Queens Sedgemoor between Glastonbury and Wells, 14 miles from the coast, in April and May.

CONCLUSIONS

1. The few recoveries of Great Black-backs, ringed as nestlings, suggest that the majority are sedentary within the local dispersive zone, but a single recovery from France indicates that some migrate. This is in agreement with the movements given for this species in *The Handbook*.

2. Lesser Black-backs, ringed as nestlings, conform to the known pattern of juvenile dispersal, and subsequent migration by way of the Atlantic coast of Europe. Marked juveniles remained in the Bristol area until the end of October. Trapped adults were reported in the local dispersive zone in later breeding seasons.

3. Herring Gulls, marked as nestlings, disperse to the adjacent coasts of the Bristol Channel with a marked preference for Somerset, where the greatest concentration occurred in the Brean Down area. A small proportion, 7.5% showed a southward movement beyond the local dispersive zone to the South Coast and N. France. Further recoveries and sight records of plastic-marked gulls, up to five years after ringing, indicate that the majority are sedentary, remaining attached to local dispersive systems. Herring Gulls marked as adults show little movement, the furthest reported being one from the Carmarthenshire coast, 50 miles to the N.W.

ACKNOWLEDGMENTS

I am indebted to Messrs. A. E. Billett, P. J. Chadwick and D. M. and R. S. Cormack for permitting me to include recoveries of gulls ringed by them, and to members of the Ornithological Section for many sight records of plastic marked gulls. Mr. D. H. Perrett of the Mid-Somerset Naturalist Society kindly undertook the collection of records of dyed gulls in that area.

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THE TRIASSIC SANDSTONES OF THE BRISTOL REGION

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INTRODUCTION

ALTHOUGH a great deal of work has been carried out on the sedimentary petrology of the Triassic of many parts of the British Isles, the Triassic deposits of the Bristol region have received little attention.

The main features of the Bristol Trias are well known, but in most accounts it is considered mainly in terms of conglomerate or breccia on the one hand, and marls on the other, and little reference is made to the presence of sandstones and other lithological types. Occurrences of calcareous sandstones were recorded, however, by Woodward (1887) and Lloyd Morgan and Reynolds (1898), and sandstones have been reported in borehole records, as for instance by Trueman (1935) and Moore (1939), and in descriptions of temporary exposures, as for instance by Kellaway (1934).

It has been remarked by several authors that the Keuper deposits are more arenaceous in the Bristol region than in the surrounding area, but few have tried to account for this distribution. Richardson (1910), after noting the distribution of sandstones, wrote : " This change in lithic structure in the Bristol area is one that might have been expected, for beds of Millstone Grit and Old Red Sandstone must have been exposed when the Triassic rocks were being accumulated. . . ." Thus he implied that the Triassic sandstones were derived from the underlying Old Red Sandstone and Millstone Grit. Kellaway and Welch (1948), on the other hand, wrote : " Where the Dolomitic Conglomerate is absent and the Red Marls overlie the Coal Measures, a vivid red sandstone commonly forms the base of the New Red Sandstone." Thus the Triassic sandstones are associated with the underlying Coal Measures.

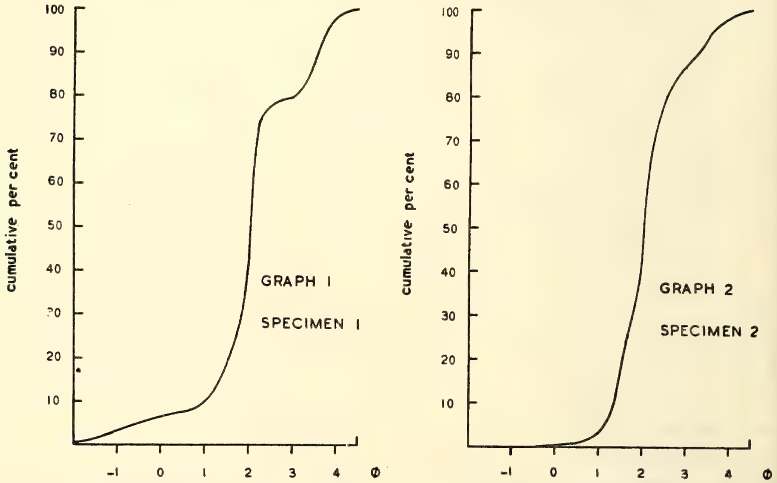
DESCRIPTION OF THE SANDSTONES

1. Grain Size Distribution

Seventeen mechanical analyses were carried out to determine the grain size distribution of the sandstones. The analyses were performed by sieving, using Endecott's (Filters) Ltd. 3-in. brass standard test sieves based on the A.S.T.M. scale at $\sqrt{2}$ intervals. The specimens were disaggregated usually by crushing in an iron mortar and sampled by repeated quartering; where the amount of carbonate cement was large, samples were disaggregated by boiling in dilute hydrochloric acid. It was found that 50 gm. of material was a convenient quantity for the analyses. The results were plotted as cumulative frequency curves, using the ϕ notation (Krumbein, 1936) in order to use a statistical treatment in describing the features of the distribution.

The median, M ϕ, was used to express the average grain size. The quartile deviation, QD ϕ, was used to indicate the degree of scatter of the curves. The conventional sorting coefficient, So, which is the geometrical quartile deviation, was also calculated. The quartile skewness, SkQ ϕ, was used to describe the asymmetry of the curves. These measures and their significance are described in many textbooks of sedimentary petrology, such as Krumbein and Pettijohn (1939). Two typical cumulative frequency curves are shown in Fig. 1.

Fig. 1. Typical cumulative frequency curves.



Graph 1, Specimen 1, Red sandstone from Horsefair, Bristol. Sample disaggregated by crushing in mortar. The kink at about 3ϕ marks the discontinuity between the curves of the detrital and the cementing material.

Graph 2, Specimen 2, Red sandstone from Eastville Park, Bristol. Sample disaggregated by boiling in hydrochloric acid. The curve is smooth and of simple sygmoidal shape.

The results of the mechanical analyses are given in Table 1 and show that all the specimens analysed have very similar grain size distributions. The average median, $M \phi$, is 2.1, which corresponds to an aperture of just under 0.25 mm. The lowest $M \phi$ is 1.8 and the largest is 2.5 (corresponding to 0.3 mm. and 0.15 mm., respectively) ; the total range of the median is therefore less than one Wentworth unit.

TABLE 1

Results of Mechanical Analyses

Specimen	$M\phi$	Q1	Q3	$QD\phi$	So	$SkQ\phi$
1	2.05	1.70	2.35	0.32	1.25	—0.02
2	2.05	1.65	2.35	0.35	1.25	—0.05
3	1.85	1.55	2.25	0.35	1.25	0.05
4	2.05	1.70	2.45	0.37	1.30	—0.02
5	1.90	1.70	2.20	0.25	1.20	0.05
6	1.80	1.30	2.30	0.45	1.35	—0.02
7	1.95	1.55	2.25	0.35	1.25	—0.05
8	2.00	1.40	2.35	0.45	1.35	—0.12
9	1.90	1.60	2.30	0.35	1.25	0.05
10	2.30	1.50	3.60	0.70	1.60	0.25
11	2.00	1.35	2.50	0.57	1.50	—0.07
12	2.30	1.95	2.90	0.42	1.30	0.12
13	2.20	1.95	2.75	0.40	1.30	0.15
14	2.20	1.85	2.65	0.40	1.30	0.05
15	2.35	1.90	3.35	0.72	1.65	0.35
16	2.50	1.90	3.45	0.77	1.70	0.17
17	2.30	1.90	3.50	0.80	1.75	0.40

The quartile deviation, $QD \phi$, is small in all cases, ranging from 0.25 to 0.8, which indicates good sorting. The So values also indicate good sorting, for the highest value of So obtained was only 1.75, and a value below 2.5 indicates a well-sorted sediment.

The skewness is in most cases very small, but it is notable that it is largest in samples of finest grain, and where large it is always positive, that is skewed towards the smaller material. The explanation of this positive skewness in the fine grained samples is the presence of fine grained cementing material, which is not sorted like the detrital material. The effect of unsorted cementing material on the cumulative frequency curve is shown usually at about 3ϕ in the form of a kink on an otherwise smooth and symmetrical curve (Fig. 1, Graph 1).

It is evident from the analyses that the sandstones are very well sorted, indicating most probably the action of currents. The grain size distributions of the sands are similar to those obtained by other workers for beach and wind deposits (see for example Carroll, 1939).

2. MINERAL CONTENT

Mineral determination was carried out on 41 samples of Triassic sandstones collected in the Clevedon–Portishead area, Cromhall, Tytherington, Chipping Sodbury, Chew Stoke, Hunstrete, Pensford, and other localities in the Bristol region.

The heavy mineral constituents were concentrated by means of heavy liquids (mainly bromoform), but panning, the centrifuge, and an experimental model of a mechanical vanning shovel designed by Dr. C. R. Burch were used to assist the separation in certain instances. For separations of small quantities, the evaporating dish method was favoured (Carroll, 1938).

The minerals were examined by means of ordinary grain mounts and thin sections, the immersion method, X-ray diffraction analysis, polished surfaces of mineral grains and rocks, and measurements of radioactivity.

Because of the great abundance of opaque constituents in the heavy mineral assemblages, it was decided to examine them by means of ore-microscopy. The grains were mounted in cylindrical blocks of ' Marco Resin ', ground and polished, and the surfaces examined by reflected polarised light.

DESCRIPTION OF MINERALS.

Non-opaque constituents.—Quartz. Quartz, the commonest mineral in the sandstones, occurs in all grain sizes up to several millimetres across. There are several varieties, none of which appears to be particularly dominant in any grain size. Some grains show complete extinction, and others exhibit strain-shadow extinction. A certain number of the grains are composite, including quartzite, vein quartz, and metamorphic quartz. Many of the larger grains of quartz are well rounded, and some grains appear to be of the millet-seed type ; these occur in the sandstones along the Portishead–Clevedon ridge. The smaller grains are less rounded, and the very small grains, particularly those occurring in the marly sandstones, are very angular. Inclusions of minerals, bubbles and dust occur in the quartz and may occasionally show orientation.

Feldspar. The feldspars represented are microcline, sodic plagioclase and orthoclase, but they are not common. The occurrence is typically in rounded, iron-stained grains, but several examples were found of an original detrital grain of plagioclase with a secondary growth of clear, more sodic feldspar of authigenic origin ; the authigenic feldspar shows good crystal outlines (Pl. 1, Fig. 1) and may be compared with that described by Reynolds (1929).

Calcite. Calcite occurs sometimes as detrital grains, which are distinguished in thin section by the presence of a 'brown ring' which indicates ferruginous staining of an original detrital grain of calcite. The main role of calcite, however, is as a cementing material, of varying degrees of coarseness. Occasionally there is segregation of calcite into patches, giving rise to lustre-mottling and nodule formation.

Dolomite. Dolomite occurs in two ways—scattered in an essentially calcareous matrix or constituting the entire matrix. In the former case the dolomite displays small rhombohedral outlines and appears to be of secondary origin. In the latter case the dolomite is finely granular and appears to be of primary origin; it is often extremely abundant and may supersede the quartz as the main rock forming mineral, giving rise to sandy dolomitic limestones.

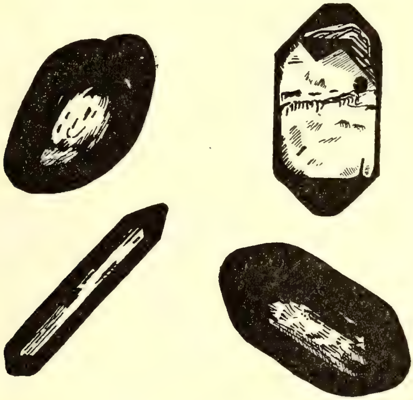


FIG. 2. ZIRCON GRAINS FROM TRIASSIC SANDSTONES, BRISTOL REGION (x200).

Zircon. Zircon occurs as small grains which are usually moderately rounded, although some grains have very perfect crystal form, and others are extremely rounded (Fig. 2). Most of the zircon grains are practically colourless, but a few grains of purple zircon were found, and rare instances of zoning were noted. Often the zircons contain inclusions of minerals, sometimes aligned along or at right angles to the optic axis; sheets of included bubbles were seen in one grain. The radioactivity of the zircons was assessed by means of Nuclear Research Emulsions, and it was found that there are two types of grains present. One type has an emission of about 10 alpha particles per grain in 20 days, and the other emits over 100 alpha particles per grain in 20 days. The detailed measurements will be discussed elsewhere.

Garnet. Garnet occurs as irregular, but roughly equidimensional grains with typical hackly fracture (Fig. 3). They are colourless and completely isotropic except in rare cases where there is anomalous incomplete extinction. Rhombohedral cleavage is sometimes seen. X-ray diffraction analysis showed the garnet to be almandine.

Tourmaline. Tourmaline occurs usually as rectangular, platy grains (Fig. 3), but occasionally elliptical and well rounded outlines were seen. Different types of tourmaline may be distinguished by their pleochroic colours, mostly in brown, green and yellow tints ; indigo, blue and mauve tints were seen in a very small number of samples.

Apatite. Apatite occurs as clear, colourless, rounded laths with sometimes a mottled appearance or indistinct striations (Fig. 3).

Rutile. Rutile occurs usually as irregular grains or rounded prisms, occasionally euhedral, in yellow, red and almost opaque varieties, sometimes exhibiting pleochroism (Fig. 3). Distinct cleavage and other markings may occasionally be seen.

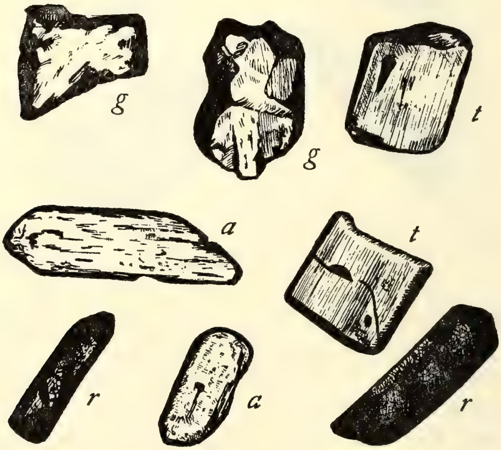


Fig. 3.—Typical heavy minerals from Triassic sandstones, Bristol region. (*a*, apatite, *g*, garnet, *r*, rutile, *t*, tourmaline ; x100).

Muscovite. The only type of mica in the Triassic sandstones is muscovite, which occurs as colourless flakes.

Monazite. Monazite occurs as well rounded yellow grains.

Barite and *celestine.* Minerals of this type occur at several localities. Pure barite and celestine occur, but flame tests and refractive index determinations often indicate a mineral that is neither pure barite nor pure celestine, but is in the barito-celestine group. The grains occur as dirty ragged flakes of low birefringence.

Minor Constituents. Chlorite, blue *anatase, brookite, fluorite, staurolite, topaz* and *sphene* are very rare constituents, and only a few of each have been found in the course of the whole investigation.

Opaque Constituents.—Magnetite. Magnetite occurs as rounded grains which are black with a bluish tinge in reflected light. The mineral has been found in a number of specimens but is never plentiful.

Ilmenite. Rounded grains have been determined as ilmenite when white alteration products were seen on the grains. The mineral is rare and has been found in only a few samples.

Pyrite. A few irregular grains which in reflected light have a tarnished yellow metallic lustre have been found in specimens from the Clevedon district.

Leucoxene. Leucoxene has been seen as an alteration product of ilmenite, and also as lozenge shaped grains which are white in reflected light. The latter only occur in the Clevedon district.

Goethite. The great majority of opaque grains were proved by X-ray diffraction analysis to be goethite. The grains are well rounded and in reflected light appear yellow, orange, or brown-black, depending upon the presence of a coating of limonite. Under the ore microscope, it is seen that the main part of each grain has the characteristic reflectivity of goethite, but there are variations in the texture. The mineral is sometimes compact, but more often it shows a spongy texture indicating a poorer degree of crystallinity (Pl 1, Fig. 2). A number of grains show evidence of original deposition by cavity filling ; banding takes place either parallel to the sides of the original cavity or in the form of comb-structure (Pl. 1, Fig. 4) or colloform banding (Pl. 1, Fig. 3). Secondary replacement may take place in addition, and it appears that magnetite may replace goethite in thin, irregular bands (Pl. 1, Fig. 4). The external shape of the grains when considered in relationship to the internal structure clearly suggests that the grains are not concretions, but are of detrital origin.

RELATIVE ABUNDANCE OF THE MINERAL CONSTITUENTS.

Next to quartz, calcite followed by dolomite are the commonest constituents, usually forming the cementing material of the sandstones ; by increase of the carbonate content sandstones pass into sandy limestones and dolomitic limestones. The feldspars are uncommon. The heavy mineral assemblage is notable for the great abundance of goethite and limonite, which in some samples must compose over 90% of the heavy minerals. The remaining opaque constituents, magnetite, ilmenite, pyrite and leucoxene, are uncommon. Of the non-opaque constituents zircon is the commonest mineral, and garnet, rutile, apatite and tourmaline are common ; muscovite and monazite occur to a much smaller extent, and all the other minerals recorded (barite, celestine, chlorite, fluorite, staurolite, anatase, brookite, topaz, sphene) have been found very sparingly during the course of the investigation.

Two systematic counts were made of heavy minerals, and the results are shown in Table 2. The count of Specimen 1 was from a separation performed on a mechanical vanning shovel, which probably gives a low count for the opaques, and Specimen 4 is also poor in opaques compared with most samples of Triassic sandstone. No apatite occurs in the count in Specimen 4 because the sample had previously been treated with acid to remove calcite.

TABLE 2

RELATIVE PERCENTAGE OF HEAVY MINERALS

Red sandstone, Horsefair, Bristol (Specimen 1)		Banded white sandstone, Chew Stoke (Specimen 4)	
opaques	63	opaques	55
zircon	18	zircon	32
rutile	8	garnet	5
tourmaline	7	rutile	3
garnet	3	tourmaline	2
apatite	1	monazite	1
monazite	tr.	muscovite	1
	100		99

3. LITHOLOGY

It has already been shown that the Triassic sandstones of the Bristol region are uniform in grain-size distribution and sorting. There is, however, considerable variation in the type of grains and the nature and amount of cementation present.

Although most grains are of quartz, some samples contain appreciable quantities of grains of limestone, grains of re-worked sandy marl, detrital calcite grains and opaque constituents. Silicified crinoid ossicles have been found in one specimen.

The cementing material is usually calcite, which may occur as large crystals enclosing quartz grains, as moderate sized grains between quartz grains, or as a mass of small or minute grains, but in the Triassic sandstones which occur along the Portishead–Clevedon ridge dolomite is the cementing mineral, and occurs as very small perfect rhombohedra. Iron oxides play only a small part in the cementation, usually cementing very small grains, and in only small patches.

The amount of cementing material present is very variable. In thin section it is seen that in some samples the quartz grains are in contact with one another, leaving only small interstices to be filled with cement, while in others the rock consists largely of carbonate, with quartz grains set in it. The amount of carbonate has has been assessed for a number of samples, and was found to vary from 4% to 74%.

The main lithological types of sandstones and associated types present in the Bristol Trias are as follows :—

(*a*) *Calcite sandstone.* This is the commonest type of Triassic sandstone in the Bristol region, and consists of sand grains in contact with one another and cemented by calcite. The rocks were originally deposited as well sorted sands, and the interstices were later filled by calcite (Pl. 1, Fig. 5). The amount of cementing material is variable, as is apparent from the varying friability of the sandstones. The sandstones are often rich in iron oxides, which impart to the rock a red or brown colour ; the individual grains have a ferruginous coating.

By increase in the relative amount of the cementing material, the sandstone passes into sandy limestone. The quartz grains are often angular, though the larger grains are usually rounded, and are not in contact with one another (Pl. 1, Fig. 6), indicating that chemical deposition of the calcium carbonate took place concurrently with deposition of the sand grains. The cementing calcite may show varying degrees of granularity, and the rocks may be red, green or grey in colour.

The true calcite-cemented sandstones are largely restricted to deposits in the proximity of the Coal Measures. The basal deposit of the Trias over Coal Measure sandstones is often this type of rock, and bands of it occur in the marls above. Often other types of lithology are associated with it, as at Chew Stoke, where marls, sandy marls, limestone sandstones and true calcite-cemented sandstones all occur together. The calcite variety of sandy limestone often occurs in bands in the marls, but it also occurs in the Dolomitic Conglomerate as at Tytherington, where it forms the basal deposit of the Trias resting on the Carboniferous Limestone.

(*b*) *Dolomite sandstone.* Dolomite sandstones are less common than calcite sandstones and consist of well rounded sand grains mutually in contact with very fine-grained dolomite in the interstices. The rocks are usually poor in iron oxides, and may be yellow, white or grey in colour.

More common, however, are dolomitic sandy limestones which consist of isolated sand grains embedded in very fine-grained dolomite, the latter representing original chemical precipitation of dolomite.

The dolomite cemented true sandstone, and the dolomitic variety of sandy limestone seem to be confined to layers within the Dolomitic Conglomerate overlying the Old Red Sandstone along the Portishead–Clevedon ridge.

The fine-grained (marls and clays) and coarse-grained (breccias and conglomerates) deposits were omitted from the present investigation. However an analysis of a number of samples of Dolomitic Conglomerate indicated a local origin for the material.

4. Sedimentary Structures in the Sandstones

The sandstones are often massive, with widely spaced bedding planes, but thin bedded sandstones also occur. Banding may be due to variations in grain size as seen, for example, at Chew Magna, or to an alternation of well cemented and poorly cemented sand layers about one millimetre thick, as at Chew Stoke.

Sedimentary structures other than banding are not common, but some have been observed, particularly in the Chew Stoke area. These include symmetrical ripple marks, asymmetrical wave marks, sun cracks and graded bedding, the last named occurring on only a small scale in beds up to about 4 cm. thick. These structures indicate a shallow-water environment.

The sandstones quite frequently contain cavities, which in some cases are due to the solution of Limestone pebbles, but in others were probably formed during diagenesis. In one specimen barite was deposited on the floor of the cavities. On weathering some rocks exhibit cavities due to an irregular distribution of the cementing material.

ORIGIN OF THE SANDSTONES

In the Bristol area the Trias may rest unconformably on the Old Red Sandstone, the Carboniferous Limestone and the Coal Measures, each of which could have contributed to the formation of sandstones. In order to investigate the source rocks of the Trias its heavy mineral content was compared with that of the older deposits. The Old Red Sandstone has been described by

Wallis (1927), the Carboniferous Limestone by Wethered (1888) and Coysh (1927), and their results are summarized in Table 3. A brief account of the heavy minerals of the Pennant sandstones was given by Boswell (1924) who listed the following as the characteristic minerals of the Pennant Series of the Bristol district : garnet, chlorite, green hornblende, muscovite, brown tourmaline, rutile, zircon, ilmenite, kyanite (rare), anatase, cordierite. As there is little indication of the relative abundance of these minerals the list is not included in Table 3. Three samples of Coal Measure sandstone (from Stapleton and St. Anne's Park) which were analysed in this investigation contained the heavy minerals listed in Table 3. A number of minerals are present in Boswell's list which are not found in the Trias, but as these were not found in the new analyses of Coal Measure sandstones, they may be present in only very small amounts.

TABLE 3

Comparative Table of Heavy Minerals

	Old Red Sandstone (Wallis, 1927)	Carboniferous Limestone (Coysh, 1927)	Coal Measures Sandstone (present investigation)	Trias Sandstone (present investigation)
abundant	apatite leucoxene zircon	ilmenite magnetite pyrite	goethite zircon	goethite limonite
common	tourmaline pyrite ilmenite limonite magnetite haematite	zircon tourmaline rutile	garnet muscovite	zircon garnet rutile tourmaline apatite muscovite barite
uncommon	rutile	muscovite	ilmenite magnetite tourmaline rutile	magnetite ilmenite celestine monazite chlorite
rare	muscovite biotite garnet	staurolite fluorite	staurolite	pyrite leucoxene fluorite staurolite anatase brookite topaz sphene

It is seen from Table 3 that the non-opaque minerals, zircon, garnet, rutile and tourmaline, occur in the Old Red Sandstone and in the Coal Measures, and all but garnet occur in the Carboniferous Limestone, but the relative abundances are different. The non-opaque heavy minerals are often scarce in the Trias, and may have been derived from any of these formations. However, the great abundance of goethite and the common occurrence of garnet in the Trias suggests that the Coal Measures have made a larger contribution to the Triassic sandstones than have the Old Red Sandstone and the Carboniferous Limestone, although these have certainly made some contribution. There is no reason to believe that the sandstones could not be locally derived, and there are no minerals present which distinctly indicate a distant source.

The calcite type of sandstones were formed in the vicinity of Coal Measure sandstones, and were probably basal deposits. Material would sometimes be carried into regions of marl deposition, and if this were deposited rapidly a band of true sandstones would be formed. If on the other hand the detrital deposition was slow, a sandy marl or sandy limestone would be formed.

The dolomite sandstones and sandy limestones are restricted to occurrences associated with the Dolomitic Conglomerate overlying Old Red Sandstone along the Portishead-Clevedon ridge. No evidence has been found which indicates why dolomite rather than calcite was precipitated in that region.

The distribution of lithological types and the manner in which they are related to the underlying rock suggests, like the evidence of the heavy minerals, that the sandstones are of local origin. In mode of origin and lithology, the Keuper deposits of the Bristol region appear similar to those of North West Somerset (Thomas, 1940) and South Wales (Pringle and George, 1948).

Acknowledgements

The present paper contains the results of an investigation carried out in the Department of Geology in the University of Bristol, and I wish to express my gratitude to all who have helped me in the course of the work. In particular my thanks are due to Dr. I. S. Loupekine for much assistance during the course of the investigation; to Mr. I. H. Ford for help with the ore-microscopy and radioactivity work; to Dr. C. R. Burch for help in mineral separation; and to Mr. E. W. Seavill for the photographs.

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Explanation of Plate I

Photomicrographs of structures and textures in Triassic sandstones, Bristol region.

Fig. 1. Thin-section of sandstone showing plagioclase detrital grain with authigenic overgrowth (x150).

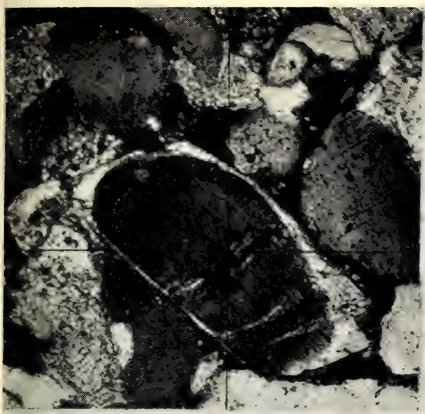
Fig. 2. Polished surface of goethite, showing spongy texture (x150).

Fig. 3. Polished surface of goethite, showing colloform banding (x150).

Fig. 4. Polished surface of goethite, showing comb-structure and replacement banding by magnetite (x150)

Fig. 5. Thin section of calcite sandstone. Iron-stained grains of quartz and limestone set in a matrix of medium grained calcite (x25).

Fig. 6. Thin section of sandy calcite limestone. Quartz grains with no ferruginous staining set in a matrix of calcite. The shape of some of the quartz grains suggests marginal replacement by the carbonate of the matrix (x25).



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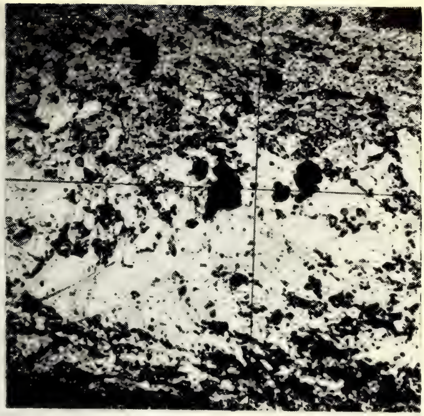

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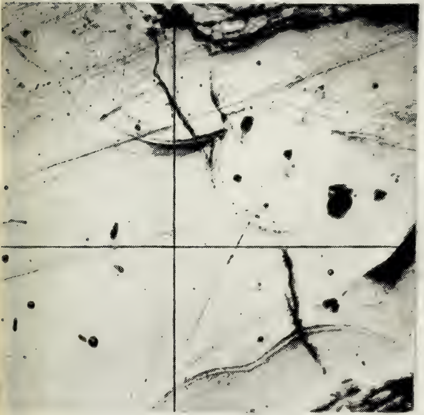

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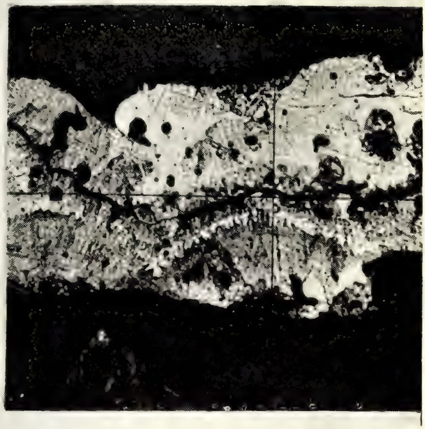

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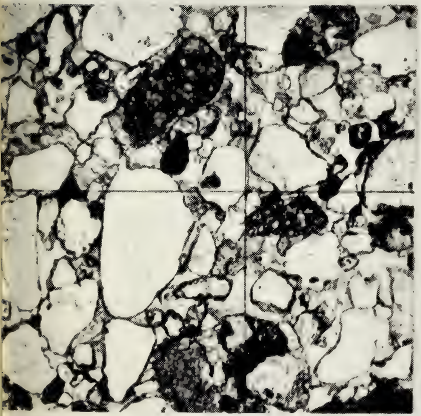

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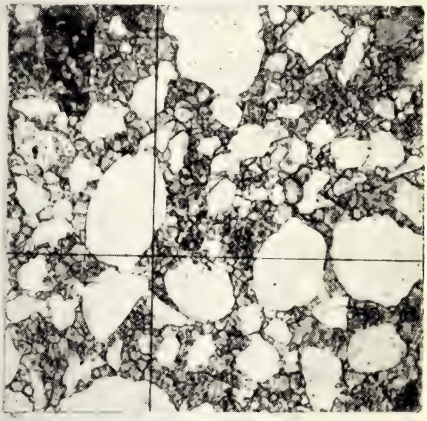

6

A REVIEW OF PAST RESEARCH ON THE LOWER PALAEOZOIC ROCKS OF THE TORTWORTH AND EASTERN MENDIP INLIERS

By M. L. K. Curtis B.Sc., Ph.D., F.G.S.

(*Read in title to Council, May 5, 1955. Received April 20, 1955*)

The Lower Palaeozoic rocks of the Bristol district occur as two widely separated inliers—the Tortworth Inlier in Gloucestershire, and the Eastern Mendip Inlier, north-east of Shepton Mallet in Somerset. The Tortworth Inlier has attracted the interest of geologists since the very earliest days of the science, and an account of the area read before the Geological Society in 1819 by Thomas Weaver contained the results of the first serious work to be carried out on any of the Lower Palaeozoic rocks of Britain. The Eastern Mendip Inlier, on the other hand, has received comparatively little attention, and it was not until the present century that rocks older than the Old Red Sandstone were known to crop out in that neighbourhood.

In the present review reference is not made to every published work on the Tortworth and Eastern Mendip Inliers, but only to those which marked a definite advance in knowledge. A recent survey of the Tortworth area by the writer has brought further facts to light, but our understanding of the geology of the two inliers is still by no means complete.

The Tortworth Inlier

During the late eighteenth and early nineteenth centuries a number of observers were active in the Tortworth area; among them were Dr. Edward Jenner of Berkeley, the well-known naturalist and discoverer of vaccination, Mr. Henry Shrapnell also of Berkeley, Mr. George Cumberland of Bristol, and the Rev. Dr. George Cooke, Rector of Tortworth.

Jenner's biographer, Baron (1838, p. 60), tells us:

> "The trap rock in Mickle-wood, and the great variety in its structure, together with the changes produced in the organic remains found in the Transition lime-stone, where it comes in contact with the trap, also particularly occupied the attention of Dr. Jenner. Specimens, illustrating these changes, were the ornaments of his study and of his garden."

Henry Shrapnell made several observations including the occurrence of fossiliferous beds associated with the trap at Middlemill, but it was the Rev. Dr. Cooke who was the most active in the geological field, and his work was several times alluded to by Weaver (1824), and again by Murchison (1839) who wrote :

> " It is delightful to trace in the MS. maps and drawings of the venerable Rector of Tortworth (the intimate friend of many of our early observers) the impress of much originality of thought and sound geological views, long before this district was described by geologists."

Cooke did not confine his interests to local geology, but extended his studies as far afield as May Hill, Wenlock Edge and Dudley ; although he published no information himself, his observations were made use of by both Weaver and Murchison, but to what extent is not clear.

Among the earliest published writings is a brief note in the Transactions of the Geological Society of 1817 on the occurrence of trap rock in Mickle Wood ; this was an extract from the minute book of the Society, and the information was contained in a letter from George Cumberland dated 1811. In the *Philosophical Magazine* (1816, p. 461) and the *Annals of Philosophy* (1818, p. 395) are notices concerning the discovery by a Mr. Bakewell of prehnite in the trap at Woodford.

On the 4th of June, 1819, a remarkable paper was read before the Geological Society by Thomas Weaver entitled " Geological Observations on Part of Gloucestershire and Somersetshire ", but the paper was not printed in the Transactions until 1824, and some information may have been added during the five years' interval. Weaver's was the first detailed study to be made of any area of Lower Palaeozoic rocks in the British Isles, and was probably also the first statigraphical work on these ancient rocks, for he discussed the fossils and compared them with those of May Hill. The collection of fossils which Weaver obtained in the Tortworth area is now preserved in the Geological Survey Museum.

The picture presented by Weaver was of an area of Transition Rocks emerging from beneath the Old Red Sandstone at the northern margin of the Bristol coal-basin, and showing the same general concentric arrangement as the overlying Old Red Sandstone and Carboniferous strata. To the west, in the Whitfield and Milbury Heath area, Weaver indicated the outcrops as swinging round in anticlinal form ; to the north, between Middlemill and Purton, the Transition Rocks were shown as being inclined to the west or south-west, and the presence of an anticlinal fold at Purton Passage was mentioned. Weaver showed the Transition Rocks to be bounded on their western side from near Stone to Purton by Old Red Sandstone, but considered the junction to be unconformable. He explained clearly how the nearly-horizontal Trias and Lias rest unconformably on the Transition Rocks, and how they were probably once continuous across the inlier until removed by denudation. The account was supported by a wealth of detailed information, particularly on the trap rocks in the Mickle Wood and Charfield areas and the limestones around Falfield and Whitfield. Weaver belonged to the Wernerian School, and it is therefore not surprising to find that he was especially interested in the trap and its origin. He indicated the presence of five or six trap bands, claimed the trap to be contemporaneous with the sediments, and like them to be of aqueous origin.

The same volume of the Transactions in which Weaver's paper was published (1824), also contained the classic account by Buckland and Conybeare of the south-western coal district of England which set out a clear picture of the geology of the Severn estuary region. The Transition Rocks of Usk and May Hill were described, and the authors (p. 248) state that they had intended to devote a chapter to the Tortworth area, but in view of Weaver's detailed paper they decided to suppress their own more rapid sketch, and referred readers to Weaver's account. Buckland and Conybeare did, however, express one opinion : they claimed that only two trap bands are present, instead of the five or six shown by Weaver, and considered them to be of an intrusive nature.

The next step forward came with the publication of Murchison's *Silurian System* in 1839. The Tortworth rocks (pp. 447–62) were assigned to the various divisions of the new system which had been established further north in the Welsh Borders. Ludlow beds were shown to be present in the anticline at Purton, and Murchison thought that all three subdivisions (Upper Ludlow, Aymestry Limestone and Lower Ludlow) were developed, and that Wenlock Limestone was present in the core of the fold. The beds at Horseshoe Farm were regarded as being of Ludlow age, though not of the usual lithology. The rocks forming most of the south-western part of the inlier were referred to the Wenlock Series, and the Wenlock Limestone was shown as extending through Skay's Grove, Falfield and Whitfield, while a second limestone was said to be developed at Barber's Quarry near Falfield. But it was the Caradoc Sandstone (which then included the rocks known to us as Llandovery) that Murchison believed to occupy most of the inlier, including all the ground from Purton to Falfield, and a considerable area stretching through Mickle Wood and Tortworth to Charfield Green. He agreed with Buckland and Conybeare in regarding the traps as intrusive ; two trap bands were stated to occur at Charfield, but in the Mickle Wood area several sills and bosses were shown.

A few years later the ground was covered by members of the Geological Survey, and the results of their work appeared in 1845 on the one inch to the mile geological map (sheet 35). The vicinity of Tortworth was surveyed (according to Woodward, 1876, p. 9) by Williams, Ramsay, Sanders and Phillips, and an explanation of the Lower Palaeozoic tract was provided by Phillips (1848, pp. 190–8) in an important memoir which contained much detailed information, particularly on the rocks at Purton Passage. Phillips accepted Murchison's view that Wenlock Limestone is present in the core of the fold at Purton, but considered it to be directly succeeded by the Upper Ludlow. The shaly strata occupying the area between Purton and Swanley were stated to be the lowest Wenlock Shales or possibly the highest Caradoc Sandstone, and the same strata were shown as extending down the extreme western side of the inlier beyond Stone (but in this Phillips differed from the one inch map which marks the beds between Purton and Swanley as Ludlow, while those on the western side of the inlier near Stone are included with the Caradoc). In the main Wenlock outcrop, around Falfield and Whitfield, the presence of two limestone bands was indicated. The trap rocks were referred to by Phillips as being " contemporaneously effused traps " which solidified " at small depths below, or even in part at the surface of the sea bed ". Attention was also drawn to the important unconformity between the Silurian and Old Red Sandstone, and it was claimed that only the Upper Old Red Sandstone is present.

The southern part of the inlier was included in the map of the Bristol Coalfield on the scale of four inches to the mile by William Sanders (1864), but apart from this no important contribution was made during the fifty years following the publication of Phillips's memoir of 1848.

Interest in the district was revived in 1898 when a meeting of the British Association was held at Bristol. An excursion was arranged to the Tortworth area, and in the guide-book, prepared for the occasion by Lloyd Morgan, the presence of Wenlock beds at Charfield was made known for the first time. Members of the excursion were entertained to lunch at Tortworth Court by Lord Ducie, and afterwards were shown his extensive collection of fossils. It was undoubtedly the interest taken in geology by the third Earl of Ducie that provided an impetus for the detailed researches that were to be carried out on the Tortworth Silurian rocks during the next ten years.

In 1901 Morgan and Reynolds clearly showed that only two trap bands are present, and, from a study of the ashy limestones in Cullimore's Quarry and Middlemill Quarry, argued that both are extrusive lavas. Detailed work by Reynolds was subsequently done on the southern half of the inlier, and not only was the area mapped on the scale of six inches to the mile, but numerous trial holes were dug (Reed and Reynolds, 1908a and 1908b). The ashy limestones in both Cullimore's Quarry and Middlemill Quarry were found to be associated with the Upper Trap, thus re-opening the possibility of an intrusive origin for the Lower Trap. It was also shown that the 500 feet of beds between the two trap bands form the main fossiliferous group of the Upper Llandovery, that a distinctive and richly fossiliferous horizon occurs just above the Upper Trap in Cullimore's Quarry, Daniel's Wood and Middlemill Quarry, and that the same distinctive horizon can be recognized in Eastwood Park. The large collection of fossils made by Reynolds is now largely housed in the Geology Department of the University of Bristol ; these, together with specimens in the Sedgwick Museum, the Geological Survey Museum, the Bristol Museum and the Ducie Collection were identified by Cowper Reed who provided the faunal lists. In a petrographical account of the igneous rocks, Reynolds (1924) put forward evidence suggesting the Lower Trap to be intrusive.

Perhaps the most significant contribution to be made to the geology of the Tortworth Inlier, since the earliest days, was the unexpected discovery in 1932 by Dr. Stanley Smith of Tremadoc Shales in an old shaft at Breadstone. These shales were found to occupy several square miles of country hitherto assigned to the Silurian, and to extend from Purton, where they are faulted against the Ludlow, as far south as Coldelm. The fossils were described by Dr. C. J. Stubblefield who declared them to be of Lower Tremadoc age. In 1944 some small inliers of Wenlock rocks near Wickwar were recorded and described for the first time by Prof. W. F. Whittard and Dr. Stanley Smith.

Recently the southern part of the Tortworth Inlier has been mapped by the officers of the Geological Survey (Kellaway and Welch, 1948, pp. 11–14). In a section across the inlier (Fig. 4, p. 13) the Silurian rocks are shown as being faulted on their western side against the Lower Old Red Sandstone, and three limestone bands are indicated in the Wenlock. Also, beds of presumed Llandovery age are stated to form some small inliers in the Little Avon River between Charfield and Wickwar.

The Eastern Mendip Inlier

The Lower Palaeozoic rocks of the Eastern Mendip Inlier have been the subject of research for a much shorter period than those of the Tortworth Inlier ; few geologists have studied the area in detail, and our knowledge of its structure and stratigraphy is due almost entirely to the work of the late Prof. S. H. Reynolds.

The existence of igneous rocks in Eastern Mendip was first made known by Charles Moore (1867, pp. 451–3). A report that peculiar minerals had been found near Stoke Lane led Moore to dig at various places in the neighbourhood, and in the summer of 1866 he succeeded in uncovering a basaltic rock which he believed to form part of a great dyke intruded in post-Carboniferous times.

John Morris (1868, p. 236), in the report of an excursion made by students of University College, London, states that the rock occurs as " a dyke of considerable thickness ", and that " it is conglomeratic in places, and pronounced by Mr. D. Forbes to be a dolerite ".

In 1873 the revised edition of the Geological Survey one inch to the mile map (sheet 19) was published ; the igneous rocks near Stoke Lane were shown as a number of isolated masses, as mapped by Bristow and Woodward, but we are told that Ussher regarded them as forming a continuous mass extending from Beacon Hill to Downhead (Woodward, 1876, p. 14). A study of the microscopic characters of the rock was made by Rutley (1876), and later by Teal who described it as an andesite (Geikie and Strahan, 1899, pp. 110–11).

Towards the end of the last century and at the beginning of the present century a number of quarries were opened in the igneous rocks, and this encouraged Reynolds to make a careful survey of the whole area. He soon made the surprising discovery that the andesite is associated in Sunnyhill Quarry with tuffs containing Silurian fossils. Thus Reynolds not only demonstrated that the igneous rocks are extrusive, but also proved them to be of Silurian age, and so added a further system to the geological map of Somerset.

In a detailed account of the inlier Reynolds (1907) described the Silurian rocks as forming the core of an anticline, and as being succeeded, probably unconformably, by the Old Red Sandstone. The andesite was shown to occur as two large masses, one in the neighbourhood of Downhead, and the other extending westwards from Moon's Hill Quarry. Reynolds considered the andesite to be probably not less than 400 ft. thick and to dip fairly steeply to the north-north-west. The andesite is underlain by tuffs containing fossils which Cowper Reed believed to belong to the Upper Llandovery ; indications of the fossiliferous tuffs were found in several places, but the best section was in Sunnyhill Quarry where the tuffs could be seen dipping northwards beneath the andesite and to be partly interbedded with it. A coarse ashy conglomerate was described as occurring at Beacon Hill and to the east of Moon's Hill Quarry, but its relationship to the other rocks of the inlier was not seen. Reynolds suggested that this rock may be a coarse water-deposited tuff or may represent material filling volcanic vents.

Further information was obtained from a number of trial holes dug to the south-east of Moon's Hill Quarry and from cuttings made when a line of rails was constructed from Downhead Quarry to

Long Cross Bottom (Reynolds and others, 1909; Reynolds, 1912). Mudstones and shales seen in these exposures were found to be normal sediments without the admixture of volcanic material. A considerable fauna obtained from them was at first thought by Cowper Reed to be a Llandovery fauna, but later when more specimens became available a Wenlock age was suggested. Southward dips were observed in these Wenlock mudstones and they were said by Reynolds to overlie the andesite and to be the youngest rocks exposed in the inlier.

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C.	Milburne, Mrs. D.	Syston Court Cottage, Mangotsfield, nr. Bristol
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	Miller, K. W.	St. Vincents, West Town, nr. Bristol
	Milton, J.	10 Randall Road, Clifton Wood, Bristol, 8
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	Mogford, E. H.	3a Southfield Road, Westbury-on-Trym, Bristol, 9
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A(J).	Moss, S. W.	Do.
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	Neville, Miss M.	7 Belmont Road, St. Andrew's, Bristol, 6
	Niblett, E. G. M.	33 Beaufort Road, Clifton, Bristol, 8
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	Owens, Mrs. N. M.	10 Radley Road, Fishponds, Bristol, 5

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C.	Palmer, Mrs. C. D.	Do.
C.	Palmer, Miss E. M.	Do.
C.	Palmer-Smith, Mrs. M.	202 Prekersleigh Road, Malvern, Worcs.
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	Pemberton, Miss J. A. W.	14 Cambridge Park, Redlands, Bristol, 6
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	Plowright, Mrs.	Do.
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	Popplestone, C.	29 Burlington Road, Redland, Bristol, 6
	Popplestone, Mrs. C.	Do.
A.	Popplestone, Miss L. J. T.	Do.
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	Pratt, W. W.	1 Hanham Road, Kingswood, Bristol
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	Pyke, Mrs. H. D.	Do.
	Quick, Mrs. O. E., B.Sc.	129 Stoke Lane, Westbury-on-Trym, Bristol, 9
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	Rawcliffe, Mrs. B.	22 Abbotts Road, Hanham, Bristol
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	Read, Miss F. D.	37 Naishcombe Hill, Wick, Bristol
A.	Reeves, J. W.	284 Wells Road, Bristol, 4
C.	Reynolds, J. F., B.A.	Queens College, Taunton, Som.
	Richards, S. W.	Langley, Swan Lane, Winterbourne, nr. Bristol
	Richards, Mrs. S. W.	Do.
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	Rogers, Miss M. H., M.A.	Vyvyan House, Clifton Pk., Clifton, Bristol, 8
C.	Room, Miss E. M.	Meadowside, Chew Stoke, nr. Bristol
C.	Room, P. J.	Do.
C.	Room, Mrs. P. J.	Do.
C.	Roseveare, W. L.	The Orchard House, Hutton, Weston-super-Mare, Som.
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	Rosling, Mrs. H. N.	Do.
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A.	Salmond, P. W.	22 Tyndall's Park Road, Clifton, Bristol, 8
	Sampson, Miss A. M.	142 Coronation Road, Bristol, 3
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	Sewell, A.	59 Upper Oldfield Park, Bath, Som.
	Sharpe, G.	22 Woodleigh Gardens, Whitchurch, Bristol, 4
	Shaw, Miss D.	48 Kellaway Ave., Westbury Pk., Bristol, 6
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	Shepherd, Miss J. M.	66 Inkerman Close, Horfield, Bristol, 7
	Shepherd, Miss J. E.	54 Wellington Walk, Westbury-on-Trym, Bristol, 9
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	Sloane, J. F., B.Sc.	Burwalls, Bristol, 8
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	Smith, Mrs. A. M.	69 Claremont Road, Bristol, 7
	Smith D. Munro, M.R.C.S., L.R.C.P.	220 Badminton Road, Downend, Bristol
	Smith, P. G. Munro	Do.
	Smith, F. A.	31 Cromwell Road, St. Andrews, Bristol, 7
	Smith, J. H.	21 Upper Belmont Road, St. Andrews, Bristol, 6
	Smith, Mrs. L. A.	28 Bishop Road, Bishopston, Bristol, 7
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A(J).	Stott, P.	Do.
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	Thompson, Miss M. D.	3 Pembroke Vale, Clifton, Bristol, 8
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A.	Vance, Miss M.	Do.
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	Walker, Miss A.	24 Stanley Street, Stapleton Road, Bristol, 5
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C.	Wallington, Miss J.	Do.
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	Wiltshire, Miss M. O. P., D.Sc.	Clifton Hill House, Bristol, 8
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**H.*	Womersley, H., F.R.E.S., A.L.S.	Museum, North Terrace, Adelaide, S. Australia
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	Yemm, Mrs. E. W., B.A.	Do.
**H.*	Yonge, Prof. C. M., F.R.S., D.Sc.	The University, Glasgow

AFFILIATED SOCIETIES

Natural History Society, Diocesan Training College, Fishponds, Bristol
Natural History Society, Grammar School, Dursley, Glos.
Botanical and Zoological Societies, The University, Bristol, 8
Geological Society Do. Do.
Natural History Society, City of Bath Training College, Newton Park, Newton St. Loe, Bath
Scientific Society, Red Maids' School, Westbury-on-Trym, Bristol
Bristol Grammar School Field Club, Elton Road, Bristol, 8
Kingswood Grammar School, nr. Bristol
Dursley & District Bird Watching & Preservation Society, Sec., Mr. T. P. Walsh, 76 Kingshill Road, Dursley, Glos.
Scientific Group, H.M. Prison, Falfield, Glos.
Bath Natural History Society, 8 Pulteney Street, Bath.
St. Ursula's High School Natural History Society, Brecon Road, Westbury-on-Trym, Bristol, 9
Social Club (Natural Science Section), Imperial Chemical Industries, Limited, " Trafalgar ", The Promenade, Clifton Down, Bristol, 8
University of Bristol, Horticultural Science Laboratories, Bracken Hill, Leigh woods, Bristol, 8

REPORT OF COUNCIL

1955

THE membership of the Society now stands at 440, with 13 Affiliated Societies. This represents an increase of 27 members and three Affiliated Societies over 1954.

At the Annual General Meeting the officers and members of Council were duly elected. The President, Mr. Harry Savory, gave his Presidential Address on "Birds and Bird Conservation in Holland". The decision of Council to elect Professor C. M. Yonge, Dr. Harrison Matthews and Mr. H. O. Edmonds as Honorary Members was announced.

A full programme of general and sectional meetings was arranged throughout the year with two additional general meetings, one in October and one in November. It had been decided previously that no exhibition should be held.

The occasion of the visit to Bristol of the British Association (of which the Bristol Naturalists are a Corresponding Society) was marked by an exhibition which, through the kind offices of Dr. F. W. Wallis, was arranged at the City Museum. Mr. P. F. Bird acted as co-ordinating secretary. At the two excellently attended evening receptions for the Association held in the Museum the exhibits (in the preparation of which all sections participated) were explained by members of the Society.

A Junior Section was formed under Rule 27 with Members of the Section becoming individually Associate Members of the Society.

The deaths of Mr. H. S. Damsell, Mr. G. S. Maunder, Dr. Stanley Smith and Sir Arthur Trueman were noted with regret.

C. S. CARLILE, *Hon. Secretary.*

HON. LIBRARIAN'S REPORT

1955

DURING the year the Library was used regularly. 251 books were actually borrowed and members made good use of reference works and journals. The binding of periodicals is now complete and our programme for 1956 is :—

(*a*) To rearrange some of the shelves.
(*b*) To recatalogue the entire library and to include a shelf catalogue as well as an author catalogue.
(*c*) To set aside a more convenient stand than the present one to hold only new books and the most recent issue of any particular journal. Back numbers will be removed to the standard shelves on the last day of any month.

In the Library there is a suggestion book and Members are invited to indicate titles that appeal to them both in the way of general works of interest and standard reference books. Such suggestions will be considered as to their suitability by the Library Committee. It is not envisaged, however, that we shall necessarily consider with favour all the many standard text-books used by students.

If any Member has suggestions to make, perhaps he will be good enough to send them in writing to the Hon. Librarian at the City Museum.

J. H. DAVIE, *Hon. Librarian.*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

Dr. RECEIPTS AND PAYMENTS FOR THE YEAR ENDING 31 DECEMBER, 1955 **Cr.**

1954 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	To Members' Subscriptions :—				
2 0 0	Full Members	1953	– – –		
222 12 6		1954	4 0 0		
6 10 0		1955	250 2 6		
		1956	11 10 0		
		1957	1 0 0		
				266 12 6	
23 5 0	,, ,, of	1954	– – –		
1 10 0	the same household	1955	26 0 0		
		1956	1 10 0		
				27 10 0	
27 3 0	Country members	1954	– – –		
3 0 0		1955	31 3 0		
		1956	1 10 0		
				32 13 0	
4 7 0	"Old" Associates	1954	– – –		
6 6		1955	4 0 0		
				4 0 0	
1 0 0	"New" Associates	1953	– – –		
8 12 6		1954	– – –		
7 6		1955	9 2 6		
		1956	1 0 0		
				10 2 6	
10 0 0	Affiliated Societies	1954	– – –		
		1955	13 0 0		
		1956	1 0 0		
				14 0 0	
310 14 0					354 18 0
	,, Sales of Publications :—				
	Separates and Covers			5 10 6	
	Bird List			2 7 6	
	Subscribers			2 10 0	
	General Publications			2 0 0	
	Vaughan's "Avon Gorge" ...			1 7 6	
11 14 0					13 15 6
1 15 6	,, Profit on Dinner				– – –
8 2 1	,, Interest on Deposit in Post Office Savings Bank				20 2 1
332 5 7					388 15 7
776 6 2	,, Balances from last Account				807 15 0
85 0 0	,, Sale of Geological Survey of India (ex Library) ...				– – –
1,193 11 9					£1,196 10 7

A. H. PEACH, *Hon. Treasurer*,

14 January, 1956.

1954 £ s. d.		£ s. d.	£ s. d.
	By Subscriptions :—		
1 1 0	Ray Society	1 1 0	
2 0 0	S.W. Naturalists' Union	2 7 0	
– – –	Mammal Society	1 1 0	
			4 9 0
155 18 6	,, *Proceedings* (1954)	—	189 2 8
24 7 2	,, Stationery	19 13 2	
9 18 10	,, Printing	50 17 3	
			70 10 5
	,, Postages, etc. :—	—	
	Hon. Secretary and Assistants ...	32 10 7	
	Hon. Treasurer (including *Proceedings*)	5 14 1	
	Hon. Editor	14 6	
35 13 10	Mr. P. Bird (Exhibition)	4 3	
			39 3 5
3 15 0	,, Fire Insurance (Library)		3 15 0
14 1 0	,, Books and Periodicals		10 9 6
1 0	,, Rent (use of Library Room)		1 0
8 0	,, Bank Charges		9 0
9 9 9	,, Fares and Expenses of Meetings	16 3 6	
	,, Fares and Expenses of Dinner Guest (net)	7 16 9	
			24 0 3
6 0 0	,, Clerical Assistance (issue of Circulars, etc.)		6 0 0
2 0 11	,, Field Committee : Expenses		6 6
68 1 9	,, Book-binding		182 3 7
	,, Grants to Sections :—		
– – –	Botanical	10 0 0	
3 5 0	Entomological	3 5 0	
15 0 0	Geological	15 0 0	
25 0 0	Ornithological	15 0 0	
			43 5 0
4 10 0	,, Rent : Steep Holm		4 10 0
5 5 0	,, Grant to Mid-Somerset Naturalist Society		– – –
– – –	,, Special Expenses :—		
	Framing Notice of Society	1 19 6	
	Replacing Zoo Record number ...	8 0 0	
			9 19 6
385 16 9			588 4 10
	,, Balances to next Account :—		
65 9 11	Cash at Bank	123 12 4	
728 9 2	Deposit in Post Office Savings Bank ...	451 12 6	
	Cash in hands of Field Committee (including £10 granted by Council in 1955)	10 18 3	
13 15 11	Cash in hands of Hon. Secretaries ...	22 2 8	
			608 5 9
	Audited and found correct		£1,196 10 7

REPORT OF BOTANICAL SECTION
1955

At the Annual Business Meeting held in January, Mr. I. W. Evans was elected Chairman in place of Mr. F. W. Evens, who has acted for the past ten years in this capacity. The retiring Chairman was later presented with a book-token in appreciation of the work he had done for the Section. Professor M. Skene was re-elected President, Mrs. M. L. Davis, Hon. Secretary, and Dr. A. F. Devonshire, Hon. Field Secretary. Committee Members elected were: Miss D. Shaw, Mrs. G. S. Wakefield, Mr. F. W. Evens and the Chairman and Hon. Secretaries.

Field Walks were conducted throughout the Spring and Summer, and places visited were as follows :—

April : Sham Castle and Bathampton. Mr. I. W. Evans.
May : Flax Bourton. Dr. A. F. Devonshire.
May : Abbots Leigh and Pool. Mrs. G. S. Wakefield.
June : Churchill and Winscombe. Mr. C. H. Cummins.
June : Leigh Woods. Mr. I. W. Evans and Mr. S. Sargent.
July : Cadbury Camp and Tickenham. Miss D. Shaw and Mrs. G. S. Wakefield.
July : Dundry. Dr. A. F. Devonshire.
August : Observatory, Clifton Down. Mrs. G. S. Wakefield and Mr. I. W. Evans.
August : Wick, Mr. I. W. Evans.
Sept. : Pucklechurch and Dyrham. Mr. F. W. Evens.

The gardens at Brandon Hill were visited in the spring, and during the summer a number of visits were paid to the Royal Fort Gardens. By kind permission of the Botany Department, visits were also paid to the University greenhouses and to the Hiatt Baker memorial garden.

The Sectional meetings for the autumn and winter session were as follows :—

Jan. 17 : Annual Business Meeting.
Mr. R. W. Marsh—Plant Disease Control.
Feb. 21 : Mr. G. Maxwell-Davis—Common British grasses and clovers and their uses in agriculture.
Mar. 21 : Prof. M. Skene—Parasitism in Plants.
Oct. 17 : Short Talks by members :—
Mr. I. W. Evans—The pressing and preserving of herbarium specimens.
Dr. A. F. Devonshire—The New Forest, an ecological sketch.
Miss D. Shaw—Growth of the tea-plant.
Mrs. G. S. Wakefield—A visit to Kew Gardens.
No. 21 : Mr. A. J. Willis—The Ecology of Braunton Burrows, N. Devon.
Dec. 12 : Mr. S. E. Arney—Morphogenesis of the strawberry plant.

The Botanical Section was well represented at the B.N.S. Exhibition in the City Museum, held in connection with the British Association Meeting in September. The following exhibits were staged by members :—

Rare plants of the Bristol district (herbarium specimens) : Mr. I. W. Evans.
Plants of the Severn salt marshes : Mrs. M. L. Davis, Mr. I. W. Evans and Mr. and Mrs. R. F. Wills.
Liverworts : Mrs. C. I. Sandwith.
Mycetozoa : Mr. F. W. Evens.
Colour transparencies of wild flowers : Mr. R. F. Wills and Mrs. M. L. Davis.

M. L. DAVIS, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION

1955

THE 91st Annual Meeting of the Section was held on January 3, 1955, in the Botany Lecture Theatre, the University of Bristol.

Mr. N. A. Watkins was elected President, and Mr. C. L. Bell Secretary of the Section.

After the conclusion of formal business the meeting adjourned, at the President's invitation, to the Grand Hotel for informal discussion.

Apart from the Annual Meeting there were three other meetings as follows :

Feb. 7 :	Talk by Mr. R. Bassindale, on Social Insects.
Oct. 4 :	Inspection of the Lepidoptera Collections in the City Museum.
Nov. 8 :	Annual Exhibition.

The Annual Conference of the Society for British Entomology was held in Bristol during July, the Secretary being Organiser. The Conference was a success and there was a joint field meeting at Priddy, which members of the Section attended.

CECIL BELL, *Hon. Secretary.*

REPORT OF GEOLOGICAL SECTION 1955

At the Annual Business Meeting held on January 20th, the following Officers were elected :—President, Mr. F. Stenhouse Ross ; Vice-Presidents, Dr. F. Coles Phillips and Dr. Stanley Smith ; Hon. Secretary, Dr. I. S. Loupekine ; Committee, Prof. W. F. Whittard (ex officio), Mr. T. R. Fry, Mr. F. J. W. Holwill, Mr. C. E. Leese, Dr. A. Marsden, Mrs. M. M. Perkins, Dr. R. J. G. Savage, Mr. H. S. Shinner, Dr. Scott Simpson, Mr. H. W. Turner, Mrs. G. S. Wakefield and Dr. F. S. Wallis ; Recorders, Dr. D. T. Donovan and Dr. M. L. K. Curtis.

Two exhibitions were held during the year, both in the Bristol City Museum (by kind permission of the Director). The January Exhibition was open during the evening of 20th and all day on 21st. It included items contributed by various members of the Section as well as members of the Geology Department of the University and by the City Museum.

The second exhibition, held 2nd—6th September, was arranged in connection with the visit to Bristol of the British Association. More than 14 members contributed rocks, minerals and fossils of the Bristol region. There were also exhibits on local water supply, building stones and geological industries.

Members of the section, under the leadership of Mr. Fry, spent much time during the summer excavating on Dundry hill, where the old quarries had become overgrown. They re-exposed the oolites and collected many fossils from this famous site. The British Association was keenly appreciative of the work done and awarded the section a small grant towards continuance of the work. Efforts are being made to have the site preserved.

The following field meetings were held during the year :—

Apr. 20: (Leader Mr. F. R. Sterne) Saltford (Lias nodules and Sewage Works).

May 7 : (Leader Dr. D. T. Donovan) Weymouth (Upper Jurassic Succession).

June 1 : (Leader Mr. F. S. Ross) Dundry.

July 2 : (Leader Mr. T. R. Fry) Failand (jointly with Dr. Wallis's Tutorial Class).

Aug. 10 : (Leader Mr. T. R. Fry) Dundry.

The following general meetings were held during the year :—

Feb. 15 : Miss P. Lampugh Robinson—Reptile finds in Mesozoic fissures in the Bristol Channel Area.

Mar. 17 : Dr. F. J. North—W. D. Conybeare and his geological contemporaries.

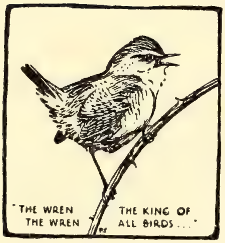
Oct. 18 : Dr. J. F. Nye—Motion of Glaciers.

Nov. 17 : Prof. L. Hawkes, F.R.S.—The Present—Key to the Pastı.

It is with the deepest regret that the Section records the death of Dr. Stanley Smith, Vice-President, and Sir Arthur Trueman, Past President.

R. J. G. SAVAGE, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION 1955


"THE WREN THE WREN
THE KING OF ALL BIRDS..."

THE membership of the Section has continued to increase during the year and, with 21 new members and 8 resignations, has now reached a total of 158.

At the Annual Business Meeting, held on Feb. 2, the Officers of the Section were unanimously re-elected and Mrs. S. M. Taylor and Mr. B. King were elected to serve on the General Committee in succession to Mr. R. V. Culverwell and the late Mr. W. R. Taylor. With the increase in work entailed by the larger number of records being submitted for publication, it was decided to form an Editorial Committee consisting of the President and Hon. Secretary (*ex officio*), and Messrs. B. King, R. H. Poulding and M. A. Wright. This Committee will be elected annually, its members being eligible for re-election.

Eight other meetings were held in the winter session as follows :—

Jan. 19 : Mr. G. Mountfort—Some observations on the Hawfinch.
Feb. 2 : Annual Business Meeting : Messrs. D. M. and R. S. Cormack—Caithness and its Birds.
Feb. 18 : Miss K. Tousey—Audubon's America.
Mar. 16 : Lt.-Col. N. Rankin—Wildlife in South Georgia.
Apr. 1 : Field-work Programme Meeting.
Sept. 28 : Exhibits and Communications by members.
Oct. 21 : Mr. P. J. Conder : The life history of the Wheatear.
Nov. 25 : Mr. H. G. Hurrell—Dippers and Pine Martens.
Dec. 9 : Mr. H. J. Boyd—On being a Goose.

The average attendance was 84.

Three evening field-walks were arranged during May—over Barrow Hill and Bourton Combe on the 3rd, at Saltford on the 12th and Little Stoke Farm, Patchway on the 26th. A very successful all-day excursion to Abbotsbury took place on May 15.

As in recent years the main activity of the Section has been co-operative field-work. The programme, arranged at the April meeting, included a repeat census of the rookeries within the boundaries of the City and County of Bristol, and an investigation into the movements of Herring Gulls from Steep Holm—by means of sight records of birds caught and dyed red on the tail—to supplement ringing recoveries. The Buzzard survey of the 1954 sample area of N. Somerset was repeated and combined with the Wood Warbler Distribution Enquiry. Members also assisted with census work on the Mute Swan and Heron for the British Trust for Ornithology, in addition to continuing to complete B.T.O. nest and roost record cards.

In the autumn the diurnal migration watches were enthusiastically supported and, with the help of neighbouring societies, a much more comprehensive study was made possible than in the two preceding years.

The eight registered ringers in the Section ringed nearly 2,000 birds during the year. Included in this total were Hen Harriers, Fulmars and 1 Greenshank ringed in Scotland, Black-headed Gulls and Curlew in Wales, and 170 Herring Gulls trapped at night on Steep Holm. In addition large numbers of passerines, including 279 Blue Tits, 209 Starlings, 143 Greenfinches and 159 House Sparrows, were trapped locally.

Fuller details about the above-mentioned field-work, ringing and subsequent recoveries, will appear in the Field-work Report, 1955, to be published in the Autumn.

P. J. CHADWICK, *Hon. Secretary.*

ACCOUNT OF THE GENERAL MEETINGS

1955

THE 92nd Annual General Meeting was held on January 27th, when the election of Officers and Council for the ensuing year took place.

The subject of the Presidential address by Mr. Harry Savory was " Birds and Bird Conservation in Holland ", which was introduced by a topographical description of the country. By means of lantern slides which reproduced the lecturer's own photographs, the abundant and varied bird life of Holland was described, including the Avocet, Spoonbill, Ruff, Cormorant, Heron and Stork.

At the General Meeting held on February 24th, Mr. George Meade King, a member of the British Alpine Club, introduced the film " The Conquest of Everest" to a well-attended meeting of members and guests at the Physics Lecture Theatre.

During October two General Meetings were held. On October 6th, Mr. E. L. Kelting, Chief Engineer of the Somerset River Board, lectured on " The Bridgwater Bay Nature Reserve ", describing the artificial Huntspill River and the 6,000 acres of Nature Reserve along the coast. Dr. Steven of the Marine Biological Station, Plymouth, was prevented by illness from lecturing at the second meeting on the 27th, when Members welcomed Dr. Kitching of the Zoology Department of the University, who introduced two remarkable colour films. The first dealt with Connemara and the second with Lough Ine where valuable experiments in marine biology had been conducted.

Two General Meetings were also held in November, the additional meeting being of a special nature, when on November 10th Mr. Mervyn Cowie introduced his film " The Game Animals of Kenya " on behalf of the Fauna Preservation Society to a large number of Members and others in the Physics Lecture Theatre. On the 24th, Dr. F. S. Wallis, Director of the City Museum, gave an illustrated lecture on " The Contacts of Archaeology and Petrology ". Dr. Wallis traced the history of Science through a period of intense differentiation to one of mutual interdependence and dealt with many aspects of Archaeology and Petrology in England and Wales.

At the last General Meeting of the year, Mr. Philip Brown, Secretary of the Royal Society for the Preservation of Birds was unable to lecture through illness. Fortunately, Mr. George Edwards, a member of the Council of the same Society, was able to take his place when Members enjoyed an Ornithological lecture of unusual interest and were shown three films of great beauty dealing with bird life.

The Meetings held during the year were well attended and appreciated as were the General Field Meetings organised in connection with the spring and summer programme.

GENERAL FIELD MEETINGS 1955

Date	*District*	*Leaders*
23 April	Inglestone Common and Wickwar	Mr. C. L. Bell Mr. & Mrs. D. Cullen
21 May	The Arboretum	Mr. Ivor Evans
18 June	Badminton	Mrs. R. Millard Miss M. Habgood
9 July	Uphill and Brean Down	Mr A. C. K. Fear
13 August	The Quantocks	Mr. T. H. Payne Mr. P. Room
10 September	Mells	Dr. Devonshire Mr. & Mrs. D. Cullen

C. S. CARLILE, *Hon. Secretary.*

OBITUARY

DR. STANLEY SMITH

IN Dr. Stanley Smith, who died on July 1, 1955, the Society has lost one of its most distinguished members in the academic sphere. Born in Middlesbrough, he graduated at Armstrong College, Newcastle, and had worked in the universities of Cambridge, Aberystwyth, London and Toronto before he came to Bristol, as a lecturer in the Department of Geology at the university, in 1922. He was then, at the age of 39, already an internationally known expert on fossil corals. Throughout his time in Bristol he continued to research in this field and his life's work on rugose corals is generally recognised to be as substantial an original contribution to palaeontology as that of any British contemporary.

However, Dr. Smith's interests were by no means narrow. He had worked on the lead and zinc ores of Northumberland and he made contributions to the stratigraphy of the Bristol area, some of which were published in these Proceedings. He was also very knowledgeable in Greek and Roman antiquities and had largely completed an interpretation of Theophrastus's writings on minerals at the time of his death.

The Society, of which he was an active member from his first year in Bristol, had the advantage of his leadership on numerous geological excursions. He was hon. secretary of the South Western Naturalist's Union for many years and served a term of office as president.

Retirement from his post as reader in palaeontology in 1948 did not interrupt Dr. Smith's researches nor his active participation in the life of the Bristol Naturalists Society ; nor was he daunted by the developing affliction of his illness.

All those who were associated with him remember with gratitude how his great fund of knowledge was always readily available to them, and they miss his patient explanations and courteous, unassuming manner. The warm sympathy of the Society is extended to Mrs. Smith.

BRISTOL BOTANY IN 1955

By Cecil I. and N. Y. Sandwith

(*Read in title to Council, May 3, 1956. Received Feb. 9, 1956.*)

A VERY backward spring ended in a wet and chilly May and early June, but was followed by a perfect summer, the best we have had since 1947.

Last summer's good weather continued into the autumn and the trees kept their beautiful colours up to the end of November, which was a better month than usual. The gardens suffered from the drought of July and August, the wilting ground flora of the woods was a distressing sight, and the summer wild flowers went over very quickly.

But the balance was redressed in December, which ended in gales and heavy rain, spoiling the Christmas holiday for outdoor pleasures.

In the following notes the initials G.W.G. are those of Mr. G. W. Garlick. We are much indebted to Mr. C. E. Hubbard for help with the identification of grasses.

Corydalis solida (L.) Sw. Combe Dingle, **G.**, perhaps on the site of an old cottage garden now vanished, *A. G. H. Sargent.*

Papaver Lecoqii Lamotte. Marshfield, **G.**, *Dr. D. Munro Smith.*

Nasturtium microphyllum Rchb. Inglestone Common, **G.**, 1951, *E. Milne-Redhead,* see *Proc. Cotteswold Nat. Field Club* for 1953, vol. xxxi. p. 256 (1955).

N. microphyllum Rchb. × *officinale* R.Br. Boxwell, **G.**, 1951, *E. Milne-Redhead,* loc. cit.

Lepidium latifolium L. Is still at Berrow, **S.** *Dr. D. Munro Smith* reports a single plant from the sand-dunes.

Raphanus maritimus Sm. Still at Brean, **S.**, in some plenty at the edge of cliffs on the south side of the Down, 1952, *J. C. Gardiner.*

Melandrium album (Mill.) Garcke × *dioicum* (L.) Coss. et Germ. Hybrids between the White and Red Campion were indicated by Mr. White (*Flora*, p. 187) as occurring in our district and have recently been collected on Wapping Wharf, Bristol Harbour, and at Avonmouth Dock, **G.**, 1947, by *C.I.S.* and *N.Y.S.*, and on the Ridge Estate, Yate, **G.**, 1953, by *G.W.G.* See also "Bristol Botany in 1923" for a record from Clapton-in-Gordano, **S.** The characters of such hybrids have been well tabulated by Dr. H. G. Baker in his account of these species for the *Biological Flora of the British Isles* (*Journ. of Ecology*, 35, p. 271, 1947).

Sagina maritima Sm. On the river wall, Sheperdine, **G.**, *G.W.G.*

Hypericum montanum L. Compton Martin Wood, **S.**, *N.Y.S.*

Tilia cordata Mill. Hutton Wood ; King's Wood, Winscombe; Rodney Stoke Wood ; and Asham Wood, **S.**, *Dr. N. W. Moore* and *N.Y.S.*

Vitis vinifera L. Established in Cheddar Gorge, **S.**, *I. W. Evans.*

Lotus tenuis Waldst. et Kit. By the Severn below Berkeley, **G.**, abundant in one place, *R. B. Abell* and *C. W. Bannister*, see *Proc. Cotteswold Nat. Field Club* for 1952, vol. xxxi. p. 147 (1954).

Lathyrus sylvestris L. Railway embankment below Iron Acton Church, **G.**, *G.W.G.*

L. Nissolia L. Grassy bank, Sheperdine, **G.**, *Mrs. D. Munro Smith.*

Sorbus porrigentiformis E. F. Warburg. On Worlebury Hill, both above Weston-super-Mare and on the side above Kewstoke, **S.**, *Dr. E. F. Warburg.*

Cotoneaster horizontalis Dcne. A very small bush is established on a rocky slope of Clifton Down, **G.**, *N.Y.S.*

C. microphylla Lindl. Quarry under Tytherington Camp, and at Engine Common, Yate, **G.**, *G.W.G.*

Saxifraga granulata L. Hillside at Hawkesbury, **G.**, *Dr. D. Munro Smith.* A most interesting addition to the Glos. side of our area, the Wotton and Dursley records given in *Fl. Glos.* (p. 209) being still doubtful.

Callitriche platycarpa Kütz. In an important paper dealing with species occurring in the Netherlands, a Dutch student of *Callitriche*, Dr. H. D. Schotsman, has shown that *C. platycarpa* is a good species, distinguished from *C. stagnalis* Scop. by characters of the stigmas, seeds and pollen-grains. Dr. W. A. Sledge, of the Botany Dept. of Leeds University, sent on loan to Dr. Schotsman Miss Roper's gathering from Alveston Old Church, **G.**, which was recorded in White's Flora (p. 528) and *Fl. Glos.* (p. 218) as *C. palustris* L. Dr. Schotsman has identified it as *C. platycarpa*. *C. palustris* may now safely be removed from the Bristol list : in fact there seems to be no evidence for its occurrence in Britain.

Epilobium hirsutum L. With white flowers in a ditch bordering a lane leading from Siston Common to Bridgeyate, **G.**, *Dr. D.*

Munro Smith. The clumps grew alternately with others of the typical pink-flowered form.

E. palustre L. Marsh by the railway, Engine Common, Yate, **G.**, *G.W.G.*

E. adenocaulon Hausskn. Williselm Farm, Hill, and Oldbury Naite, **G.**, *G.W.G.* Asham Wood, **S.**, *N.Y.S.*

Apium inundatum (L.) Rchb. fil. Pond at Little Sodbury End, Sodbury Common, **G.**, *G.W.G.*

Galium Cruciata L. Wood-border above Hutton, **S.**, *N.Y.S.*

G. pumilum Murray. In limestone grassland above Cheddar Wood, **S.**, *N.Y.S.*

G. tricorne Stokes. Beet field above Beek's Mill, Marshfield, **G.**, *G.W.G.*

Valerianella carinata Lois. On the pavement, The Parade, Hotwells, Bristol, **G.**, *G.W.G.*

Inula crithmoides L. A single large plant with many flowering stems, probably at least 2 years old, has appeared at the north end of Berrow salt-marsh, **S.** First noticed last May by *Dr. A. J. Willis*, and the first record for the mainland of North Somerset. The most likely origin of this plant is seed brought by some agency from the colony on the southern cliffs of Steep Holm which face the shore at Berrow.

Cirsium dissectum (L.) Hill × *palustre* (L.) Scop. Wet field by Woodend Lane, Hill, **G.**, June 1943, *E. Nelmes* in *Herb. Kew.*, and recorded as " between Hill and Rockhampton " in *B.E.C.*, 1943–44 Rep. p. 733 (1946), but omitted from *Fl. Glos.* which was probably in the press at that time.

C. arvense (L.) Scop. var. *mite* Wimm. et Grab. Redland, **G.**, *Herb. Ley*, see *Fl. Glos.* p. 291. Glen Frome, Stapleton, **G.**, 1920, *C.I.S.* and *N.Y.S.* Roadside, Failand Hill, **S.**, 1920, *C.I.S.* and *N.Y.S.* The first records for this not infrequent variety, which is wild and is not to be confused with the adventive vars. *vestitum* and *integrifolium.*

Hieracium glevense (Pugsl.) Sell et C. West. Side of towpath below Leigh Woods, **S.**, 1954, *B. Miles,* det. *Sell* and *West.* Formerly placed under *H. exotericum* Jord., this species is the *H.pellucidum* of *White, Flora*, p. 405, and is now recorded for the first time for North Somerset.

H. salticola (Sudre) Sell et C. West. Leigh Woods, **S.**, *A.H.G. Alston,* det. *Sell* and *West.* A member of the Section *Sabauda,* and possibly the *H. boreale* Fries of *White, Flora*, p. 409, from this locality, but there are no specimens from Leigh Woods in the White, Bucknall or Roper Herbaria. *H. salticola* is distinguished by almost glabrous phyllaries and deeply toothed leaves.

Lysimachia Nummularia L. Mr. Garlick's important discovery of ripe capsules and seeds on plants of Creeping Jenny observed during the hot, dry summer and autumn on a ditchbank at Spar Pools, Yate, **G.**, is fully described by him in a note published this year in *Proc. Bot. Soc. Brit. Is.* The remark in the new British Flora, " Fr. apparently never produced in Britain ", can now be modified.

Menyanthes trifoliata L. In a sphagnum marsh by the railway, Engine Common, Yate, **G.**, *G.W.G.*

Symphytum orientale L. Roadside near Longwood House, Failand, **S.**, *C.I.S.* and *N.Y.S.*

Lithospermum arvense L. Hinton, **G.**, *Dr. D. Munro Smith.* Cornfield between Froglane Farm and Ramhill, Westerleigh ; and beet field above Beek's Mill, Marshfield, **G.**, *G.W.G.*

Veronica filiformis Sm. By the Frome at the foot of Bury Hill, Winterbourne, **G.**, *G.W.G.*

Euphrasia confusa Pugsl. On Mendip N.E. of Cheddar, **S.**, also a hybrid of this species and *E. anglica* Pugsl., 1953, *P.F. Yeo.*

Stachys × *ambigua* Sm. Hook Row, Berkeley, **G.**, *G.W.G.*

Atriplex littoralis L. On tidal mud at Avonmouth, **G.**, 1953, *C. W. Bannister*, see *Proc. Cotteswold Nat. Field Club* for 1953, vol. xxxi, p. 259 (1955). A very interesting discovery for the Glos. side of the district.

Euphorbia platyphyllos L. Rediscovered " several years ago " in a field below South Stoke, Bath, **S.**, in the area where it was known to the Bath botanists of the last century, *Miss F. M. Barton.*

E. Cyparissias L. Still in great plenty in Miss Roper's locality at Whitewell Bottom, **G.**, *G.W.G.* and *N.Y.S.*

Juglans regia L. At least three Walnut trees are well established in woods above Hutton, **S.**, *Dr. N. W. Moore* and *N.Y.S.*

Betula pubescens Ehrh. Horton Great Trench, Lower Woods ; and Ramhill, Coalpit Heath, **G.**, *G.W.G.* Confirmed by *Dr. E. F. Warburg.* Mr. White (*Flora*, p. 544) gave no records from the Glos. side, but confessed to uncertainty in determining Birches. There is a single record of *B. pubescens* from Stinchcombe Hill in *Fl. Glos.*, p. 430.

Carpinus Betulus L. Rare in Compton Martin Wood, **S.**, *Dr. N. W. Moore* and *N.Y.S.*

Quercus petraea (Mattuschka) Liebl. × *Robur* L. Lyncombe Hill Woods, Sandford ; and in Rodney Stoke Wood, **S.**, *Dr. N. W. Moore* and *N.Y.S.*

Q. Cerris L. Hutton Wood, **S.**, *id.*

Q. Ilex L. Trees are established near the S.W. border of Cheddar Wood, **S.**, *id.*

Salix triandra L. Streamside between Leechpool Farm and Engine Common, Yate ; by the Frome, Mill Lane, Chipping Sodbury ; and near Scotland's Farm, Hill, **G.**, *G.W.G.*

Epipactis purpurata Sm. Priest Wood, Cromhall, **G.**, *E. P. Bury.*

Orchis Fuchsii Druce × *praetermissa* Druce. Pondside, Horton Hall, **G.**, *G.W.G.*

O. praetermissa Druce. Meadow at Parkfield Colliery South, Shortwood ; and a few plants at Ramhill, Coalpit Heath, **G.**, *G.W.G.* Marshy valley in Asham Wood, **S.**, *N.Y.S.*

Gymnadenia conopsea (L.) R. Br. var. *densiflora* (Wahlenb.) Rchb. Shapwick Moor, **S.**, 1919, *Miss I. M. Roper*, see *B.E.C.* 1919 Rep., vol. v. p. 681. Max Meadow, Winscombe, **S.**, 1919, *id.* Specimens from both localities are in Miss Roper's herbarium at Leeds University and have now been verified by *Mr. V. S. Summerhayes.* The variety is tall and robust, with a dense spike of more rosy-red flowers, and is usually found in fens.

Platanthera chlorantha (Custer) Rchb. Compton Martin Wood ; and Asham Wood, **S.**, *N.Y.S.*

Iris foetidissima L. Frequent in Shiplate Wood, between Loxton and Bleadon, **S.**, *Dr. N. W. Moore* and *N.Y.S.*

Leucojum aestivum L. Several clumps thoroughly established among Ramsons and Bluebells in a wood near Dyrham, **G.**, 1954, *Dr. D. Munro Smith.*

Allium vineale L. var. *vineale.* Lane near Severn House Farm, Berkeley, **G.**, *G.W.G.*

Juncus compressus L. Abundant by the Severn below Berkeley, **G.**, *C. W. Bannister*, see *Proc. Cotteswold Nat. Field Club* for 1952, vol. xxxi. p. 153 (1954).

Acorus Calamus L. Pond in quarry below Tytherington Camp, **G.**, *G.W.G.*

Alisma lanceolatum With. Ditch along Hill Lane, Hill, **G.**, *G.W.G.*

Baldellia ranunculoides (L.) Parl. Pond, Engine Common, Yate, **G.**, *G.W.G.*

Sagittaria sagittifolia L. In the Frome, Damson's Bridge, Winterbourne Down, **G.**, *G.W.G.*

Zannichellia palustris L. var. *pedicellata* Wahlenb. et Rosen. Rhine by the Severn running into the Berkeley Pill, **G.**, *G.W.G.*

Eriophorum angustifolium Honck. Marsh by railway, Engine Common ; and marsh below Yate Rocks, **G.**, *G.W.G.*

Carex × *evoluta* Hartm. (*C. lasiocarpa* Ehrh. × *riparia* Curt.). We learn with great pleasure from *Dr. A. J. Willis* that he has rediscovered this hybrid in its solitary British station on the peat of Sharpham Moor Plot, **S.** Some time during the 'thirties this plant disappeared when the plot was overgrown by carr, and it was thought to be extinct. The ground has now been cleared and Dr. Willis reports that the sedge is abundant over an area of several square yards. This is a most interesting and instructive example of vegetative survival through a long phase of darkness beneath a tangle of bushes.

C. pallescens L. Asham Wood, **S.**, *N.Y.S.*

C. extensa L. Several plants on mud-flats near the Old Church, Clevedon, **S.**, *I. W. Evans.*

C. arenaria L. By the Portishead railway below the Suspension Bridge, Clifton, **S.**, *I. W. Evans.* Evidently an introduction in this strange habitat.

Milium effusum L. A single tuft of a form with striped leaves, like those of the var. *picta* of *Phalaris arundinacea*, was noticed in the woodland of Wapley Bushes, **G.**, by *Mr. I. W. Evans.* Rodney Stoke Wood, **S.**, *N.Y.S.*

Festuca longifolia Thuill. Burnham sand-dunes, **S.**, May 1952, *I. W. Evans*, det. *C. E. Hubbard.* The first record for the district of this grass, which was probably sown in this locality. It is a member of the difficult *ovina* group.

× *Festulolium Holmbergii* (Dörfl.) P.Fournier. (*Festuca arundinacea* Schreb. × *Lolium perenne* L.). With the parents on the grassy verge of the towpath by the Avon near Clifton Bridge Station, **S.**, *C.I.S.* and *N.Y.S.*. Confirmed by *Mr. C. E. Hubbard*, and the first record of this hybrid for our district. It has been collected in Britain on very few occasions but is doubtless overlooked. Known by its intermediate habit and facies, ciliate leaf-auricles and sterile pollen.

Bromus Thominii Hard. Old mining ground, Velvet Bottom, Charterhouse-on-Mendip, **S.**, 1954, *C. C. Townsend*, det. *C. E. Hubbard.*

Adiantum capillus-veneris L. Has been known for many years on the south churchyard wall at Batheaston, **S.** *Miss E. H. Stevenson* informs us that the first record known to her came from the late *C. D. Heginbotham* in 1930.

Polystichum lobatum (Huds.) Woynar. Burberrow Lane, Westerleigh Hill, **G.**, *G.W.G.*

Chara globularis Thuill. var. *capillacea* (Thuill.) Zanev. Pond, Froglane Pit, Coalpit Heath, **G.**, *G.W.G.*

ALIENS. *Sisymbrium altissimum* L. Arable land above Hutton, **S.**, *N.Y.S.*

Trigonella coelesyriaca Boiss. Avonmouth Dock, **G.**, *C.I.S.* and *N.Y.S.*

Guizotia abyssinica (L. fil.) Cass. Quarry at Fishponds, **G.**, *Dr. D. Munro Smith*, det. *I. W. Evans.*

Mentha × *alopecuroides* Hull. Waste ground, Fishponds, **G.**, *Dr. D. Munro Smith*, det. *R. A. Graham.*

Chenopodium Bonus-Henricus L. Waste ground, Bridge Street, Bristol, **G.**, *I. W. Evans.* Not recorded as a Bristol alien for very many years.

C. hybridum L. Waste ground, Horsefair, Bristol, **G.**, *I. W. Evans* and *G.W.G.*

Asparagus officinalis L. subsp. *officinalis.* Railway embankment near Iron Acton Station, **G.**, *G.W.G.*

Panicum capillare L. var. *occidentale* Rydb. In the garden of St. Catherine's Court, Bath, **S.**, *G.W.G.* Identified by *Mr. C. E. Hubbard*, who points out that this variety, with longer and more pointed spikelets, is the plant usually met with in this country.

Echinochloa frumentacea Link. St. Anne's tip, **S.**, 1954, *I. W. Evans.*

Sorghum caffrorum Beauv. var. *breviaristatum* Snowden. Portway tip, below Sneyd Park, **G.**, Oct. 1950, *C.I.S.* The var. *albidum* (Koern.) Snowden was collected on the same tip in Sept. 1952, by *C.I.S.* The specimens were kindly identified by *Mr. J. D. Snowden.* The previous record from this tip of *S. vulgare* Pers., *sens. lat.*, in " Bristol Botany in 1952 ", probably refers to one of these two varieties of *S. caffrorum.*

Nardus stricta L. Wapping Wharf, Bristol Harbour, **G.**, 1946, *I. W. Evans.* A very unexpected species to add to the *Adventive Flora.*

Catapodium rigidum (L.) C. E. Hubbard var. *major* (J. B. Presl) Lousley. Ashton Gate tip, **S.**, 1940, *I. W. Evans.* This adventive variety, like Mr. Evans's other grasses, was determined by Mr. Hubbard.

Lolium persicum Boiss. et Hohen. Avonmouth Dock, **G.**, 1954, *C. C. Townsend*, and 1955, *C.I.S.* and *N.Y.S.*, det. *C. E. Hubbard.* New to the *Adventive Flora.*

L. temulentum L. Roadside near Farmborough, **S.**, 1954, *Mrs. E. M. E. Bell.*

In *Proc. Bot. Soc. Brit. Is.*, vol. 1, pt.4, pp. 562–563 (Oct. 1955), the Department of Botany of the University of Bristol announces the initiation of experimental sowing and transplants of seven of our rare limestone species in natural habitats where they do not at present occur. The species are *Arabis stricta*, *Helianthemum apenninum*, *Geranium sanguineum*, *Trinia glauca*, *Linosyris vulgaris*, *Veronica spicata* subsp. *hybrida* and *Koeleria vallesiana*. The aim of these experiments is to study the many possible reasons for the restriction of such species to certain habitats. The announcers appeal to those who find these seven species in new habitats to communicate with them before reporting the find publicly or privately. The finder may then be asked to regard the knowledge as confidential, since the outcome of the experiments must be safeguarded. " After the experimental stage has passed, it should be possible to announce the location of the sites. "

Such experiments are doubtless of great scientific interest and value, but we should like to plead that the location of the sites not merely may, but *must*, eventually be published. If this is not done, and if such experiments are extended, the work of those who study and record the natural distribution of British plants is gravely impaired, while old-fashioned field-botanists will continually suspect the presence of a sinister " fifth column " which is working against them.

We cannot end these notes without reference to the excellent and most enjoyable sketch of the vegetation of our area by Dr. J. F. Hope-Simpson and Dr. A. J. Willis, which was published in the volume " Bristol and its Adjoining Counties ", on the occasion of the visit of the British Association last September.

BRISTOL BIRD REPORT
1955

COMPILED BY THE EDITORIAL COMMITTEE OF THE
B.N.S. ORNITHOLOGICAL SECTION

P. J. CHADWICK B. KING
H. H. DAVIS R. H. POULDING
M. A. WRIGHT

(*Read in title to Council, May 3, 1956. Received April 9, 1956.*)

THIS issue covers records for 1955, and is the result of observations by forty-three members of the Ornithological Section and various non-members. Although bearing the revised title BRISTOL BIRD REPORT it is in continuation of issues published annually in the *Proceedings* of the Society from 1936 under the heading ORNITHOLOGICAL NOTES, BRISTOL DISTRICT, and is, therefore, the twentieth of the series. Reports for subsequent years will continue to appear with the revised title.

Noteworthy records from the North Somerset reservoirs include those of a Ferruginous Duck at Chew Valley in January ; a Black-throated Diver at Cheddar in February ; a Bittern at Blagdon in February-March ; twenty-five Bewick's Swans at Cheddar in March ; a Glaucous Gull and a Sandwich Tern at Chew Valley in March and June respectively ; and a Red-breasted Merganser at Cheddar in December. A Shag was recovered at Cheddar in August and another at Chew Valley in October, while at the former a Little Auk spent ten days or longer in the second half of December. From Chew Valley there are breeding records of Garganey, Shoveler and Tufted Duck, and at the same place the breeding of Shelduck and Lesser Black-backed Gull was proved for the first time at any Somerset reservoir. Following the abnormally dry summer, water levels during the autumn passage were extremely low, and many waders were reported. Green Sandpipers at Chew Valley reached the unusually large total of twenty-two (Aug. 28th), while Greenshank numbers at the same reservoir were correspondingly high. With an abundance of feeding ground available, Ringed Plover, Turnstone, both Godwits, Wood Sandpiper, Spotted Redshank, Knot, Little Stint, Dunlin and Ruff were also observed at Chew Valley on autumn migration.

The event of the year was the occurrence on three successive days in March of a male Ring-necked Duck at the Wildfowl Trust's headquarters, Slimbridge—a new bird for Gloucestershire, and the first authentic record of the species in Europe. Other interesting visitors to the New Grounds included a Greylag Goose and two Lesser White-fronts among common White-fronts, January-March ; a Little Egret in April ; a Leach's Petrel in September; a Whooper Swan in November ; and an Avocet in December.

From other localities are records of a Hoopoe at East Harptree in April and another at Slimbridge in August; Montagu's Harriers on Mendip in May ; and Spotted Redshanks at Sand Bay and Dyrham Park in August-September. An Iceland Gull among roosting Herring Gulls on Steep Holm in March was, perhaps, the same bird as that seen at Barrow Gurney reservoirs and Bedminster Bridge in January-February. Another Iceland Gull was identified at Weston-super-Mare in December.

As usual in recent years Buzzards were reported from far and wide. At nests located (two only) there was nothing to show that young were reared nor was there evidence of a successful eyrie anywhere in the area under review. The failure of birds to bring off young was, doubtless, an outcome of myxomatosis and the consequent widespread scarcity of the rabbit.

Unless otherwise stated the records below refer only to 1955, and for the most part are the result of contributions by the following *members :* R. Angles, A. E. Billett, H. J. Boyd, G. Bright, B. K. Brooke, G. C. Buxton, Mrs. S. I. Buxton, P. J. Chadwick, Miss G. G. Clement, G. E. Clothier, D. M. Cormack, R. S. Cormack, Miss D. Crampton, H. H. Davis, Miss P. Farmer, Mrs. H. Fox, C. H. Fry, D. R. Hamblett, R. G. Hamilton, Dr. G. G. Hartill, C. Hockey, H. G. Hockey, W. A. Holmes, B. King, H. R. H. Lance, A. C. Leach, H. W. Neal, P. J. M. Nethercott, Mrs. B. C. Palmer, Miss E. M. Palmer, R. Pitman, R. H. Poulding, J. A. Pryce, W. L. Roseveare, J. H. Savory, Peter Scott, T. B. Silcocks, Dr. D. Munro Smith, J. Vallis, Miss C. A. L. Wareham, N. Webb, R. F. Wills and M. A. Wright. *Non-member contributors* are A. R. Angell, J. Blathwayt, G. L. Boyle, K. B. S. Brown, A. G. Dixon, T. Hamlett, S. T. Johnstone, R. E. Jones, J. A. McGeoch, Prof. M. F. M. Meiklejohn, T. D. H. Merrie, Miss E. D. Overend, E. G. Richards, C. J. H. Rogers, H. S. Semple, C. M. Swaine, S. Turner, J. A. F. Wilkins and P. Wycherley. Observations are followed by the appropriate initials throughout. Initials D.B.P.S. denote records from *Report of the Dursley and District Bird-Watching and Preservation Society*.

The area covered, is that part of Gloucestershire (**G.**) lying east of the Severn and south of a line from the New Grounds to the county boundary at Tetbury, and Somerset (**S.**) north of the R. Axe and a line from Wells to the county boundary near Frome.

For the purpose of this Report the area extends westward into the Channel and Estuary to include the promontory of Brean Down, and the islands of Steep Holm and the Denny (cf. Sketch Map, *Proc. B.N.S.*, 1947, p. 225).

BLACK-THROATED DIVER *Gavia arcticus*

S. One viewed at only a few yards range close to water's edge, Cheddar res., Feb. 6 by B.K., who has forwarded a detailed description.

RED-THROATED DIVER *Gavia stellatus*

S. Single bird, Blagdon res., several dates, first half of Feb., was finally found dead (B.K.B., G.G.C., C.A.L.W., N.W.). One, Cheddar res., Jan. 30 (P.J.C., B.K.) and two, Feb.2 (H.R.H.L.); one still present, Feb. 6, 12, and one, probably the same, found dead on 19th (C.H.F.). One, Cheddar, Mar. 6, 9 (C.H.F., H.R.H.L.); this, or another, found dead on 20th (B.K.). Observers again record that birds showed evidence of being oiled.

GREAT CRESTED GREBE *Podiceps cristatus*

S. Total of 26, Cheddar res., Mar. 9, 13 (B.K., H.R.H.L.). Three or more pairs bred, Blagdon res. (P.J.C.) and a pair reared three young, Chew Magna res. (P.J.C., R.P.). Ten or twelve pairs, Chew Valley res., late Apr.—early May (P.J.C., B.K.); five nests noted, same reservoir, July 17, and 35 ads. and six or seven young counted, Aug. 14 (R.H.P.).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. Two, sometimes three, Cheddar res, several dates, Jan. 1–14 (B.K., H.R.H.L., N.W.), but P.J.C. records none present on 23rd or 30th. Two, same reservoir, various occasions, Feb. 6–25 (P.J.C., A.G.D., A.C.L.) and Nov. 14 (H.R.H.L.). Single birds, Barrow Gurney resrs, Jan 23, Feb. 27, Mar. 29 (G.E.C., W.A.H., J.A.P.) and Chew Valley res., Aug. 14 (R.H.P.).

LITTLE GREBE *Podiceps ruficollis*

G. Pair with nest on small lake, Badminton Park, May 15 (R.H.P.).

S. At least eight pairs with young, Blagdon res., Sept. 4; breeding also reported from Chew Magna res.—3 pairs with small young, Aug. 7 (P.J.C., R.P.), and Litton res.—pair with small young, Sept. 4 (B.K.).

LEACH'S PETREL *Oceanodroma leucorrhoa*

G. One, evidently a storm driven bird, in flight over the saltings, New Grounds, Sept. 18 (H.J.B.).

MANX SHEARWATER *Procellaria puffinus*

S. One recovered on outskirts of Bath, early Oct; bird sent to Mr. E. Smith of Combe Down, who fed it on small fish and reports that it was still alive at the close of the year (B.K.). For previous instance of a Manx Shearwater found in the same area and being successfully maintained in captivity see *Proc. B.N.S.*, 1953, p. 389; *Rep. Som. Birds*, 1953, p. 7.

GANNET *Sula bassana*

S. Dead bird, Brean Down, Feb. 27 (C.H.F.). A juvenile, probably storm driven, found alive in a garden, Weston-super-Mare, Sept. 5 (H.R.H.L.).

CORMORANT *Phalacrocorax carbo*

S. Up to eight, Cheddar res., various dates, Jan.–Mar., with max. number of fifteen, Jan. 23, Feb. 6 (P.J.C., C.H.F., B.K.). Five, Chew Valley res., Sept. 25 (B.K.) and four, Nov. 13 (A.C.L.). Single birds, or parties of up to five, Weston-super-Mare and Brean Down areas, various occasions, June–Nov. (R.A.). Twenty-three occupied nests, Steep Holm, Mar. 19 (D.M.C., R.H.P. *et al.*); evidence of roosting, same place, when small parties seen arriving on cliffs in afternoons of Oct. 15, Nov. 13 (R.H.P.).

SHAG *Phalacrocorax aristotelis*

S. A juvenile ringed on Lundy, July 8, recovered alive, Cheddar res. Aug. 31 (H.R.H.L.); another, also juv., ringed Lundy, June 30, found dead, Chew Valley res., Oct. 3 (R.H.P.).

HERON *Ardea cinerea*

S. Brockley Combe: 31 occupied nests (15 in ash trees and 16 in oaks), Apr. 23 (B.K., N.W.). Uphill Grange: 20 occupied nests in 17 trees (ash, oak, birch, poplar, chestnut and fir again being used), May 9 (W.L.R.). Two occupied nests (in white poplar), Orchardleigh Park, nr. Frome, Apr. 21 (E.D.O.). No conclusive report of breeding, Warleigh Wood, nr. Bath (C.J.H.R.). Birds numbering from 20 to 35 or more, Chew Valley res., various dates, July 10–Aug. 7, but only 12 or so a week later (evidence that many were juveniles) (P.J.C., R.H.P.). Ten, Blagdon res., July 10, and sixteen on 14th (P.J.C.).

LITTLE EGRET *Egretta garzetta*

G. One, apparently adult, visited the New Grounds on or about Apr. 6, and remained, usually at water courses between the decoy and the saltings, until Apr. 13. It reappeared on 19th but was not seen afterwards. First authentic record for Bristol area and for county of Gloucestershire (cf. *Brit. Birds*, XLVIII, p. 320).

BITTERN *Botaurus stellaris*

S. One, disturbed from reed-bed, Blagdon, Feb. 27, crossed reservoir and alighted in conifer plantation, where it was later found in "freezing" attitude on dead branch of pine tree (P.J.C.); this, or another, watched at close quarters taking fish, same reservoir, Mar. 3 (B.K.).

MALLARD *Anas platyrhynchos*

G. Highest total on Estuary, New Grounds, early in year–510, Jan. 23 ; count of 240 (nearly all males), same place, June 1, while of 80 or more on river, July 13, some were flightless owing to moult ; with max. total of 580, Sept. 20, autumn numbers for same area were little more than half of those returned for recent years (H.J.B.).

S. Coastal counts include *c.* 150, Axe Estuary, Jan. 29 (T.B.S.) ; 109, Sand Point, Nov. 29 (R.A.) ; and 199 off Brean Down, Dec. 3 (M.A.W.). Reservoir totals of 112, Cheddar, Jan. 23 (B.K.) and 105, Dec. 11 (J.A. McG.) ; 80, Barrow Gurney, Feb. 27 (P.J.C.) ; 241, Blagdon, Feb. 27, and 561, Aug. 7 (P.J.C.)—increasing to 1,000,[1] Sept. 18, 25 (B.K.B., B.K.) but decreasing to 540, Oct. 30 (B.K.) ; 600, Chew Valley, Sept. 25 (B.K.) and 980, Oct. 16 (G.C.B., S.I.B.). Forty on lake, Orchardleigh, Aug. 21 (E.D.O.).

TEAL *Anas crecca*

G. Max. counts, New Grounds : 380, Jan. 23, and *c.* 200, Dec. 26 (H.J.B.).

S. Max. coastal counts : *c.* 300, Brean Down, Jan. 29 (T.B.S.) and 175, Dec. 18 (P.J.C., J.V.) ; *c.* 150, Yeo Estuary, Jan. 23 (T.B.S.) and 114, Dec. 31 (W.L.R.). Highest reservoir totals : 466, Barrow Gurney, Jan. 9 (P.J.C.) ; 330, Cheddar, Jan. 23 (P.J.C., B.K.) ; 250, Chew Valley, Sept. 8 (H.H.D.)—increasing to 550, Oct. 16 (G.C.B., S.I.B.) ; and 1,050, Blagdon, Nov. 20, Dec. 19 (P.J.C., B.K., R.P.).

GARGANEY *Anas querquedula*

G. New Grounds (W.T. enclosures or decoy) : single male, Apr. 7–14 ; a pair on 14th ; and one, various dates, Aug. (H.J.B., B.K.).

S. Pair, Blagdon res., Apr. 21 (G.C.B., S.I.B.) ; two in flight and on water with *A.crecca*, Aug. 1, 14 (P.J.C.). Pair, Chew Valley res., Apr. 17, 18, and single males, June 5, 18 (G.L.B., B.K.) ; successful breeding, same place, where female with brood of eleven seen, June 18 (B.K.)—first breeding record since 1949 (cf. *Proc. B.N.S.*, 1949, p.33).

GADWALL *Anas strepera*

G. Up to 32, New Grounds, Jan.–Feb. and up to 18, various dates, late Aug. to mid-Dec.; some probably hand reared birds gone feral, or descendants of hand reared birds (H.J.B.).

S. Pair, Blagdon res., Jan. 9, 10 (B.K.B., B.K.), and at same place : two pairs, Feb. 10 (B.K.B.), Mar. 13 (C.H.F.); three, Feb. 13 (P.J.C.) and three (male and 2 females), Dec. 31 (A.R.A.). Pair, Chew Valley res., Oct. 23 (G.L.B.). Male, Cheddar res., Dec. 23 (P.J.C.) and three females on 24th (J.A.McG.).

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[1] Cf. *Proc. B.N.S.*, 1954, p. 28 for similarly high inland count.

Wigeon *Anas penelope*

G. Totals of 600 on Estuary, New Grounds, Feb. 20, and 750 on 23rd, but very few, mid-Mar. ; ten, same place, Sept. 20—subsequently increasing to 400, Nov. 13 ; 1,450, Dec. 20, and 2,000 on 22nd (H.J.B.).

S. Max. reservoir counts of 740, Chew Valley, Mar. 3 (B.K.) and 1,120 (exceptional for time of year) on 20th; 800, Blagdon, Nov. 6 (B.K.). At Cheddar res., where the bird is seldom numerous now, highest totals reported were 35, Jan. 30 (P.J.C., B.K.) and 32, Dec. 18 (J.A.McG.).

Pintail *Anas acuta*

G. Counts of 110, New Grounds, Jan. 23, and 65, Feb. 23 ; thirty, same place, Nov. 13, and *c.* 80, Dec. 13 (H.J.B.).

S. Forty, Cheddar res., Jan. 30 (B.K.). Up to 12, Blagdon, Cheddar and Chew Valley resrs., various dates, Jan.–Mar. and Nov. (G.C.B., A.C.L., R.P. *et al.*).

Shoveler *Spatula clypeata*

G. New Grounds : eight to 30 or more, various dates, Jan.–Feb. and mid-Aug. to mid-Dec. (H.J.B.).

S. Reservoir records of eleven, Cheddar, Jan. 23 (P.J.C., B.K.) and 34, Dec. 23 (P.J.C.) ; 40, Blagdon, Mar. 3, and 70, Nov. 6 (B.K.) ; 150, Chew Valley, Mar. 20 (G.C.B.) and at least 60, Apr. 8 (P.J.C.). Nest with eggs, Chew Valley, May 1, and female with brood of ten, same place, July 6 (B.K.).

Scaup *Aythya marila*

S. Reservoir records : female, Blagdon, Jan. 2 (B.K.B.) ; two males, same place, Feb. 13 (P.J.C.) and a female, Oct. 30–Nov. 6 (B.K.) ; and up to four, Cheddar, Dec. 19–21 (H.H.D., B.K., E.M.P.). Two, Axe Estuary, Oct. 29 (W.L.R.).

Ring-necked Duck *Aythya collaris*

G. An ad. male in full plumage visited a pond in the W.T. enclosures, New Grounds, Slimbridge, on Mar. 12, 13, and on both dates was identified at very close range ; seen in flight near same spot on 14th but not reported subsequently. First authentic record for Europe (cf. also *Brit. Birds*, XLVIII, p. 377).

Tufted Duck *Aythya fuligula*

G. Single wild bird in W.T. enclosures, New Grounds, throughout the year ; five on decoy pool, same place, Nov. 17 (H.J.B.).

S. Exceptional counts, Blagdon, of 429, Feb. 27 (P.J.C.) ; 760 (highest total yet for any Som. res., and probably due to birds being frozen out elsewhere), Mar. 3 (B.K.) ; and 312, Nov. 15 (H.R.H.L.). Other reservoir counts of 50, Barrow Gurney, Feb. 27 (P.J.C.) and 250, Cheddar, Dec. 21 (H.H.D.). 57 on lake, Orchardleigh, Mar.

20 (E.D.O.). At least seven pairs bred successfully, Chew Valley res. (P.J.C., B.K., R.H.P.).

POCHARD *Aythya ferina*

G. Male on decoy pool, New Grounds, Nov. 17 ; up to four in W.T. enclosures, same place, various dates, early Oct. to end of year (H.J.B., B.K.).

S. Max. reservoir counts of 307, Blagdon, Jan. 5, and 751, Nov. 20 (P.J.C.,R.P.) ; 300, Cheddar, Jan. 9 (B.K.) ; 790, Chew Valley, Mar. 13 (G.C.B., S.I.B.) ; and 920, same place, Dec. 5 (B.K.).

FERRUGINOUS DUCK *Aythya nyroca*

S. One, Chew Valley res., Jan. 2 ; bird, first seen preening on reservoir bank and afterwards on water in close company with Tufted Duck and Pochard, was identified by B.K. and E.G.R., who have supplied satisfactory details (cf. also *Rep. Som. Birds*, 1955.).

GOLDENEYE *Bucephala clangula*

S. Max. count of 21, Blagdon res., Jan. 23 (B.K.B.); 14, same place, Feb. 13 and Mar. 3 (B.K.), and seven (5 males), Nov. 20 (P.J.C., R.P.). Eleven, Cheddar res., Jan. 23–26 (P.J.C., B.K.) and 14, Dec. 26 (W.A.H., B.K.). Twenty, Chew Valley res., Mar. 13 (B.K.) and 13, Apr. 11 (G.C.B., S.I.B.).

COMMON SCOTER *Melanitta nigra*

S. Female off Brean Down, Nov. 6 ; bird caught and found to be heavily oiled (P.J.C., M.A.W.) ; two females in flight, same place, Dec. 18 (J.A.P., R.H.P., J.V.).

RED-BREASTED MERGANSER *Mergus serrator*

S. A female or immature, Cheddar, Dec. 26, 28 ; second record only for the reservoir (B.K.).

GOOSANDER *Mergus merganser*

S. One, Chew Valley res., Jan. 9 (G.C.B.) and one, Blagdon res., several occasions, Jan. and Dec. (B.K.B., C.H.F., W.A.H. *et al.*). Single male on lake, Orchardleigh, Jan. 4, 7 (E.D.O., P.W.). Up to five, Cheddar res., frequently, late Jan.-late Mar. (various observers) and single bird twice in Dec. (H.H.D., J.A. McG.).

SMEW *Mergus albellus*

G. Single " redhead " on decoy pool, New Grounds, Nov. 20, 22 (S.T.J.).

S. Frequently noted, Blagdon and Chew Valley resrs., early Jan. to mid-Mar. (various observers) ; max. of seven, Chew Valley, Mar. 3 (B.K.). Seen once only, Barrow Gurney—single bird, Jan. 12 (A.C.L.), while the only Cheddar record is of two, Dec. 29 (W.L.R.).

SHELDUCK *Tadorna tadorna*

G. Highest count on Estuary, New Grounds, early in year—56, Jan. 29 ; total of 65 (only 5 ads.), same place, Aug. 21, and similar number, Sept. 18, Dec. 11 (H.J.B.).

S. Max. coastal returns (Oct.–Dec.) Sand Bay, Weston Bay and Brean Down areas: 396, Oct. 2; 491, Nov. 20; 390, Nov. 27; and 399, Dec. 3 (R.A., T.B.S., M.A.W. *et al.*). Up to five, Chew Valley res., Jan., Mar. and May (various observers) ; breeding proved for first time at N. Som. resrs. when adult with single duckling seen, Chew Valley, July 17, 24 (B.K., R.H.P.). One, Barrow Gurney resrs., Mar. 20 (J.A.P.) and six, Blagdon res., Sept. 18 (B.K.).

GREYLAG GOOSE *Anser anser*

G. Single ad., New Grounds, Feb. 8–Mar. 28 (H.J.B.).

WHITE-FRONTED GOOSE *Anser albifrons*

G. Party of 14 overhead, Sea Mills, Jan. 14 (A.C.L.). Marked increase at New Grounds from relatively small number of 1,000 at close of previous year to counts of well over 3,000 by early Feb. ; peak total of *c.* 3,900 on 11th. More than 2,000 still present, same place, Mar. 13, but sharp decrease to 500 on 15th and fifteen on 22nd ; party of three stayed till Mar. 28. A single bird at New Grounds, Sept. 27, was first autumn arrival; max. monthly counts thereafter : 297, Oct. 31 ; 700, Nov. 26 ; 1,410, Dec. 31 (H.J.B. *et al.*).

S. The following noted overhead : 65, Frome, Feb. 2 (E.D.O.) ; eleven, Cheddar, Mar. 12 (R.E.J.) ; and 50 flying N.N.E., Weston-super-Mare on 15th (R.A.).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Single ad. seen with common White-fronts, New Grounds, on at least four occasions, Jan. 13 to Mar. 13 (H.J.B., P.S. *et al.*).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. New Grounds : single bird, Jan. 28, and Feb. 24 to Mar. 2 ; first autumn arrivals unusually early—party of three, Sept. 14, with increase to 72 by 28th ; over 80, Oct.–Nov., with max. of 94, Nov. 25 ; some decrease by early Dec. but in contrast to most years, at least 60 still present on 31st (H.J.B.). Party of eight, flying up-river, Sharpness, Nov. 6 (R.H.P.).

BARNACLE GOOSE *Branta leucopsis*

G. One, first noted in previous Dec., remained at New Grounds till Mar. 13 ; a Barnacle × White-front hybrid, very similar to one present in winter 1953–54, and perhaps the same bird, was seen, various dates, early Jan. to mid-Mar. (H.J.B., P.S.).

Mute Swan *Cygnus olor*

G. and **S.** B.T.O. Census: total of 68 occupied nests reported by regional organizers—E.M.P., J.A.P. 70 birds on R. Avon at Old Bridge, Bath, Mar. 30, June 15 (B.K.). Max. counts, N. Somerset reservoirs : 75, Blagdon, Nov. 6 (B.K.) and 60–72, Cheddar, several occasions, Dec. (H.H.D., H.R.H.L. *et al.*).

Whooper Swan *Cygnus cygnus*

G. One on Estuary, New Grounds, Nov. 22, 23 (H.J.B.).

Bewick's Swan *Cygnus bewickii*

S. Unusually large party of 25 (15 immatures), Cheddar res., Mar. 13 (B.K.).

Buzzard *Buteo buteo*

G. Single birds, Little Stoke, Mar. 11, and at frequent intervals, Oct.–Nov. (H.H.D.) ; Littleton-on-Severn, May 8 (R.H.P.) ; Badminton, July 1 (G.G.H.); and Wick, Aug. 25, Nov. 20 (D.RH.). Single birds at intervals : Berkeley, Dursley and Wotton-under-Edge districts ; one mobbed and severely injured by Rooks, Tortworth, Mar. 10 ; three, Stinchcombe, Sept. 25 (D.B.P.S.).

S. Again reported from many widely separated localities but no record of successful breeding. Two nests located in 1954 census area and one pair suspected breeding in an adjoining area of 11 sq. kms, but no evidence that young were reared (various observers).

Sparrowhawk *Accipiter nisus*

S. Male seen chasing small party of Dunlin low over the water, Chew Valley res, Apr. 17, by G.B. and B.K., who record that the hawk struck down one of the waders into the water and then picked it off the surface and departed. Female, Steep Holm, Aug. 26, 27 (H.W.N.) and a male, Nov. 13, 14 (R.H.P.).

Montagu's Harrier *Circus pygargus*

S. Two, male and female, quartering ground over young spruce in afforested area, nr. Rowberrow, Mendip, May 10 ; birds seen by H.F., who has supplied satisfactory details. First definite record for present century (cf. *Proc. B.N.S.*, 1947, p. 245.).

Hobby *Falco subbuteo*

G. Single birds overhead, Little Stoke, four occasions, July–Sept. (H.H.D.).

S. One harrying Swallows and Martins, Bishop Sutton, Sept. 8 (H.H.D., B.K.).

Peregrine *Falco peregrinus*

S. The only inland record is of one, Cheddar Gorge, Jan. 30 (R.A.). Single birds reported from coastal areas, Brean Down to

Portishead, various occasions, Jan.–Apr. and Aug.–Dec. (W.L.R., T.B.S. *et al.*). Two, Brean Down, Nov. 13 (C.H., H.G.H.). Steep Holm records of one, Mar. 19 (P.J.C.) ; May 31 (B.K.) ; Aug. 26 (H.W.N.) ; and two, several dates, Oct.–Nov. (R.H.P.).

MERLIN *Falco columbarius*

S. One, a small dark falcon, Sand Point, Oct. 15 (R.A.).

KESTREL *Falco tinnunculus*

S. Single bird, Steep Holm, Oct. 16 (R.H.P.).

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. Three on high ground above Saltford, July 13 (T.H.), 25 (B.K.).

WATER RAIL *Rallus aquaticus*

G. Single bird, in hard weather, Duchess' Pond, Stoke Park, Stapleton, Feb. 20–27 (J.A.P.).

CORNCRAKE *Crex crex*

G. One caught (and later released) in market garden, Patchway, on early date of Apr. 11 (cf. also below) (H.H.D.).

S. One flushed from long grass, nr. Priddy, Mendip, Apr. 11 (J.A.F.W.). Bird calling, Saltford, May 12 (B.K.) and one seen, Long Ashton on 19th (G.E.C.). Remains found in tide wrack on river bank nr. Pill, May 23 (R.H.P.).

MOORHEN *Gallinula chloropus*

G. Fifty-nine, including a concentration of about 35, at two marshy ponds bordering the canal, Sharpness—an abnormally high number for a relatively small site (D.M.C., R.H.P.).

COOT *Fulica atra*

S. Cheddar res : from 1,000, late Jan. to 1,700, mid.–Mar., and from 240, late Oct. to 1,400, mid.–Dec. (various observers). Max. count, Chew Valley res., 1,500, Mar. 3 (B.K.), where at least 90 breeding pairs noted, May-June, and ads. and young estimated at 400, July 17 (B.K., R.H.P.). Well over 2,000, Blagdon res., several dates, Oct.–Dec. (B.K.). Highest total, Barrow Gurney, 265, Nov. 20 (G.E.C.). 100, Orchardleigh, Oct. 16 (E.D.O.).

OYSTERCATCHER *Haematopus ostralegus*

G. Two, New Passage, Feb. 13, Apr. 10, and six, Aust Cliff, Oct. 2 (R.H.P.).

S. More numerous than in 1954. Counts, Weston Bay, of 145 Sept. 26 (T.B.S.) ; 150, Oct. 6; and 163, Nov. 6 (R.A.). 80, Sand Bay, Dec. 4 (T.B.S.).

RINGED PLOVER *Charadrius hiaticula*

G. 200, Severn Beach, May 8, and 65, New Passage, same date (R.H.P.).

S. Inland records of 28, Chew Valley res., Aug. 30, and 37, Sept. 2 (B.K.).

GREY PLOVER *Charadrius squatarola*

S. Reported only from Sand Bay, where up to five seen, Jan. to mid. Mar., and Oct. (R.A., W.L.R., T.B.S.).

GOLDEN PLOVER *Charadrius apricaria*

G. Fifty-seven, Aust, Jan. 1, and eighteen, Feb. 13 (R.H.P.).

S. Records of small numbers, various localities, Jan.–Mar., and Oct.–Dec. ; max. totals of 300, Burnett, Dec. 2 (T.H.) and *c.* 300, Queen Charlton on 31st (G.C.B., S.I.B.).

TURNSTONE *Arenaria interpres*

G. Twelve, Sheperdine, Jan. 17, and five, May 29 (D.B.P.S.). At least 300, New Passage, Apr. 10, and 45, May 8 (R.H.P.). Two on Estuary, New Grounds, Aug. 14 (H.J.B.).

S. Nine, Clevedon, Sept. 7 (P.F.)—the only noteworthy coastal record. Party of eight (large number for inland habitat), Chew Valley res., May 14 (B.K.) ; one, same place, Aug. 20 (B.K.B.).

COMMON SNIPE *Capella gallinago*

S. Four settled in Spartina grass, Sand Bay, Feb. 12 ; two, same place, Feb. 26, Oct. 23 (R.A.). 150 or more, Chew Valley res., Sept. 8 (H.H.D.).

JACK SNIPE *Lymnocryptes minimus*

G. Two nr. Wotton-under-Edge, Feb. 25 (D.B.P.S.). One, New Grounds, Aug. 1, 2 (H.J.B.).

S. Single birds, Chew Valley res., Feb. 6 (B.K.) and Kenn Moor, Apr. 16 (R.A.).

CURLEW *Numenius arquata*

G. 100, Oldbury-on-Severn, Apr. 10 (R.H.P.).

BLACK-TAILED GODWIT *Limosa limosa*

G. New Grounds records include : 15 on Estuary, July 13, and 22, Aug. 19 (H.J.B.).

S. Single bird, Chew Valley res., May 5 (G.L.B.) ; six, same place, May 30 (B.K.) and Aug. 28 (G.L.B., P.J.C.).

BAR-TAILED GODWIT *Limosa lapponica*

G. One on Estuary, New Grounds, Aug. 3, and two on 21st (H.J.B.). Two, Aust Oct. 25 (J.A.P.).

S. Four, Weston Bay, Jan. 15, Sept. 26 (T.B.S.) ; 43, same place, Mar. 29. (B.C.P., E.M.P.). Two, Sand Bay, Sept. 17 (R.A.). One inland, Chew Valley res., Sept. 19 (G.C.B., S.I.B.).

GREEN SANDPIPER *Tringa ochropus*

G. Two, New Grounds, Apr. 19 (B.K.), and one, Aug. 1–11 (H.J.B.).

S. Two, Litton res., Jan. 23 (B.K.). One or two, Chew Valley res., Jan. 9–May 8 (G.C.B., D.M.C. *et al.*). Unusually numerous at reservoirs on autumn passage : up to 12, Chew Valley, July 17–Aug. 23 (B.K.B., R.H.P.), with max. of at least 22, Aug. 28 (P.J.C., B.K., R.H.P.) ; 21, same place, Sept. 7 (B.K.B.) and up to nine, Sept. 8–Nov. 19 (G.G.C., H.H.D. *et al.*). Single birds, Barrow Gurney, Aug. 21 (G.E.C.), and Blagdon on 28th (B.K.B.). Six, Litton, Sept. 4, 11, and one, Cheddar on 18th (B.K.). One, Chew Valley, Dec. 31 (W.A.H., T.D.H.M.) and two, Blagdon, same date (A.R.A.).

WOOD SANDPIPER *Tringa glareola*

G. One at small pool, New Grounds, Aug. 1–11 (H.J.B.).

S. Up to four, Chew Valley res., various occasions, Aug. 20–27 (B.K.B., G.E.C., P.J.C., B.K.).

REDSHANK *Tringa totanus*

G. Thirty-eight, Oldbury-on-Severn, Apr. 10 ; one ringed as nestling, same place, July 4, 1954, shot, Poole Harbour, Dorset, 72m. S.S.E, Dec. 29, 1955 (R.H.P.).

S. Six pairs at least, Chew Valley res., Apr. 24, and pair with two almost fully grown young, July 1 (B.K.). Max. coastal returns of 300, Yeo Estuary, Nov. 12, and 275 Sand Bay on 20th (T.B.S.). 115 in drained Marine Lake, Weston-super-Mare, Nov. 5 (H.R.H.L.).

SPOTTED REDSHANK *Tringa erythropus*

G. One at small pond, Dyrham Park, Sept. 9–16 (J.B.) and 23rd (D.M.C., R.S.C.).

S. Reservoir records of one, Blagdon, Aug. 14 (P.J.C.) ; up to five, Chew Valley, late Aug.-late Sept. (B.K.B., G.G.C., H.H.D. *et al.*); one, Cheddar, Sept. 18 (B.K.). Four, Sand Bay, Aug. 21 (R.A.).

GREENSHANK *Tringa nebularia*

G. One, New Grounds, various dates, early July-late Aug. ; two, evidently wintering, same place, Dec. 15 (H.J.B.).

S. Frequent, Chew Valley res., July—late Oct., with max. numbers of twenty, Aug. 28, and ten, Sept. 4 (G.G.C., R.H.P. *et al.*). Three, Blagdon res., Aug. 14 (P.J.C.) ; five, same place on 28th (T.B.S.) and three, Sept. 22 (W.A.H., T.D.H.M.). Nine, Litton res., Sept. 11 (B.K.).

KNOT *Calidris canutus*

G. Twenty-six, Purton, Apr. 11 (D.B.P.S.).

S. Coastal reports of 15, Sand Bay, Feb. 26, and *c.* 180, Woodspring Bay, Sept. 3 (R.A.). Reservoir records of 12 (exceptional number inland), Chew Valley, Sept. 2 (B.K.), and two, Blagdon, Oct. 16 (B.K.B.).

PURPLE SANDPIPER *Calidris maritima*

G. At least four, New Passage, Apr. 10, and single bird, Severn Beach, May 8 (R.H.P.).

LITTLE STINT *Calidris minuta*

S. Two, Chew Valley res., May 25 (B.K.B.) ; one, same place, Sept. 2 (B.K.), 23 (G.L.B.).

DUNLIN *Calidris alpina*

G. Spring records of 100, New Passage, and at least 500, Severn Beach, May 8 (R.H.P.).

S. High coastal returns of 1,000, Weston Bay, Jan. 1 (R.A.) and 2,000, Sand Bay on 29th (T.B.S.). Chew Valley res. : 25, May 18 (B.K.); 53, Aug. 28 (P.J.C.); and 40, Nov. 19—an exceptional winter total inland (B.K.).

SANDERLING *Crocethia alba*

G. Two, New Passage, and five, Severn Beach, May 8 (R.H.P.) ; six, New Grounds on 21st (D.B.P.S.).

S. One, Chew Valley res., May 5, and four on 18th (G.L.B. B.K.). One inland, Combe Down, nr. Bath, May 17, was seen on roof of building, twelve feet from the ground, and later on nearby road (B.K., H.S.S.) (cf. *Brit. Birds*, XLVIII, p. 544).

RUFF *Philomachus pugnax*

G. One, New Grounds, Mar. 27 (M.F.M.M.).

S. Two, Chew Valley res., Apr. 17 (G.C.B., S.I.B.). Autumn passage records, same place : one, July 17 (R.H.P.) ; up to eight, various dates, Aug.–Sept.; and single bird, Oct. 9 (J.A.P., R.H.P., *et al.*). Five, Blagdon res., Aug. 28 (B.K.B., T.B.S.) and one, Sept. 25, Dec. 5 (B.K.).

AVOCET *Recurvirostra avosetta*

G. Single bird on Estuary, New Grounds, Dec. 16 (S.T.J.).

GREAT BLACK-BACKED GULL *Larus marinus*

G. Single birds frequently, R. Avon, nr. Bedminster Bridge, Bristol, Jan. and Nov.–Dec. (P.J.C., H.H.D.).

S. Eight (6 ads.), Cheddar, Dec. 23—highest number reported from the reservoirs (P.J.C.). 43 occupied nests, Steep Holm, May 31 (R.S.C.). Again bred, probably three pairs, on the Denny (2m. off Portishead but in county of Monmouthshire) ; two nests, one with eggs, and two downy young on rocks, June 1 (H.H.D., H.W.N., J.H.S.).

LESSER BLACK-BACKED GULL *Larus fuscus*

G. An ad. of Scandinavian race, *L. f. fuscus*, or intermediate form, with single ad. *L. f graellsii*, in W.T. enclosures, New Grounds, Mar. 27 (H.H.D., M.F.M.M.).

S. The abnormal numbers roosting in previous Dec., Chew Valley res., not maintained after Jan. 2, when 700 counted. Following onset of wintry weather numbers dropped to 320 by Jan. 9, with further decreases to 120, Feb. 6, and 50, Mar. 13 (P.J.C., B.K.) ; count of *c.* 250 was, however, made, Apr. 8 (P.J.C.). Autumn counts, same place, included : 50, Sept. 25 ; 552, Sept. 28 ; 120, Oct. 9, and 200 on 30th (B.K.). Colony of twelve or more pairs occupied temporary island, Chew Valley, May–July ; breeding established, May 14, when nest with two eggs seen by K.B.S.B. and B.K. Further visits to island not possible but three broods of partially fledged young noted by R.H.P. from reservoir perimeter, July 17. Ad. ringed, Steep Holm, Apr. 6, 1954, found dead, Cheddar Gorge, July 7, 1955 (P.J.C.).

HERRING GULL *Larus argentatus*

S. Probably roosted throughout year, Chew Valley res.—counts in late afternoons included : 500, Mar. 17 (most imms.) ; 400, Apr. 8 ; and 600, Sept. 28 (P.J.C., B.K.). Up to 1,000 at roost, Steep Holm, Oct. 16, and 3,000–4,000, Nov. 12, when many ads. on nest sites and one carrying nesting material (D.C., R.S.C., R.H.P.). First-year bird ringed, Steep Holm, Mar. 21, 1955, recovered Portmadoc, Carns., 115m. N.W., Sept. 30, 1955 (P.J.C.) ; fourth-year bird ringed, same place, Apr. 4, 1954, found dead nr. Swansea, Glam., 47m. W.N.W., Nov. 11, 1955 (D.M.C.).

GLAUCOUS GULL *Larus hyperboreus*

S. A fourth-year bird, Chew Valley res., Mar. 13 ; size noted as larger than nearby Herring Gulls, and only evidence of immaturity was dark tip to yellow bill and slight, brown mottling on wing coverts (B.K.).

ICELAND GULL *Larus glaucoides*

G. and **S.** Single first year bird, Barrow Gurney resrs., Jan. 9 ; R. Avon, Bedminster Bridge, Bristol, Feb. 14, 15 (P.J.C.) ; and with Herring Gulls at roost, Steep Holm, Mar. 20 (P.J.C., R.H.P.) —possibly same individual throughout, but distinguished from light coloured bird at Barrow Gurney in previous Dec. Another first-year bird, Weston-super-Mare, Dec. 22 (H.R.H.L.,T.B.S.).

COMMON GULL *Larus canus*

G. Exceptional concentration of immatures, Old Sodbury, May 15, when *c.* 200, almost entirely first-year birds, seen on pasture (R.H.P.).

Black-headed Gull *Larus ridibundus*

S. Roost counts include: 15,000, mouth of Avon, Jan. 9 (D.M.C., P.J.C., R.H.P., M.A.W.); 4,275, Axe Estuary, Jan, 22 (P.J.C.); and 1,400, Chew Valley res., Oct. 30 (B.K.). Large numbers, occasionally exceeding 1,000, feeding, Chew Valley, during dry spell, July–Aug.; sample counts showed consistently high percentage of juveniles, varying between 20–40 per cent. (P.J.C., R.H.P.). Thirteen ads. off Steep Holm, heading for Somerset coast, May 31 (B.K.).

Kittiwake *Rissa tridactyla*

G. Exhausted bird, found inland nr. Tortworth, Feb. 3, was sent to Zoological Gardens, Clifton, where it recovered and was later released (D.B.P.S.). Single ads., freshly dead, New Passage and Oldbury-on-Severn, Feb. 13 (R.H.P.).

S. Probable remnants of "wreck," previous Nov.–Dec, included one immature, Cheddar res., Jan. 1,9 (B.K., H.R.H.L.); four dead, Sand Bay, Jan. 2 (W.L.R.); and two, Weston-super-Mare on 16th (P.J.C.). After prolonged south-westerly gales, Feb. 1–5, up to 20 or more, mostly dead, reported from coastal areas and reservoirs. One, Cheddar res., May 1, and one, dead, Chew Valley res. on 14th (B.K.). One autumn record: a first-year bird over landing beach, Steep Holm, Nov. 13 (R.H.P.).

Black Tern *Chlidonias niger*

S. In contrast to exceptional passage of May, 1954, only one spring record: single bird, Chew Valley res., May 29 (B.K.). Moderate numbers at reservoirs on autumn passage, with extreme dates Aug. 14 and Oct. 9. One, Barrow Gurney, Aug. 14 (P.J.C.) and single birds, Blagdon, various dates, Sept. 7–Oct. 9 (G.C.B., G.G.C.), but max. returns of 34, Chew Valley, Aug. 22 (B.K.B.) and six, Cheddar, Sept. 18 (B.K.).

Common Tern *Sterna hirundo* **Arctic Tern** *Sterna macrura*

S. Ten, Blagdon res., May 13 (B.K.). Only other spring records are from Chew Valley res.—highest count being seven, May 22 (G.E.C.). Small party of up to eight, several in retarded or first-year plumage, same place, June 18–July 3 (B.K.B., B.K.). Return passage also small, with reservoir counts (Commons or Artcics) of two, Blagdon, Aug. 7, and Barrow Gurney. Aug. 14 (P.J.C.); and four, Chew Valley on 28th (G.L.B.). One Arctic, Blagdon, Sept. 11 (P.J.C.); one Common, Chew Valley, Sept. 18, and three, Oct. 9 (B.K.). Single bird, Weston-super-Mare Sept. 21 (H.R.H.L.).

Sandwich Tern *Sterna sandvicensis*

S. Single bird, Chew Valley res. on unusual date of June 20 (B.K.B.).

LITTLE AUK *Alle alle*

S. One found alive, Locking, nr. Weston-super-Mare, Oct. 19 and later released on coast (H.R.H.L.). Another, swimming close to Axbridge tower, Cheddar res., various dates, Dec. 18–28 (J.A.McG., B.K., *et al.*).

WOODPIGEON *Columba palumbus*

S. One, Steep Holm, Nov. 13 (R.H.P. *et al.*)—first record for the island since 1935.

BARN OWL *Tyto alba*

S. Frequent records from localities in low-lying moors, Weston-Clevedon, and at Blagdon and Chew Valley resrs (various observers). Also reported, Charterhouse, Feb.6 (R.F.W.) ; Loxton, Apr. 17 (R.P.) ; and Long Ashton, Oct.–Dec. (M.A.W.).

LITTLE OWL *Athene noctua*

S. One, Steep Holm, Mar. 19, 21 (H.J.B., *et al.*), and another found dead on 20th (R.H.P.) ; one, same place, Nov. 13 (D.M.C.) —first records for the island since 1938.

SWIFT *Apus apus*

S. At least 1,000, Chew Valley res., June 29 when weather was dull and cold. Equally large numbers have been noted at the reservoirs during similar weather in previous years (B.K.).

HOOPOE *Upupa epops*

G. One, Shepherd's Patch, Slimbridge, Aug. 25 (S. T. per H.J.B.).

S. One shot in error for Jay, East Harptree, in April (per G.L.B.).

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. One in garden, St. George, Bristol, Apr. 7 (G.B.).

S. Single birds, Compton Bishop, Mar. 5 (P.J.M.N.) ; Cleeve Woods, Apr. 21, 22 ; Combe Down, Bath, May 27 (A.G.D.) ; and Blagdon res., Oct. 30 (B.K.).

WOODLARK *Lullula arborea*

G. Two, North Nibley, Apr. 11 ; single birds, same locality, May 19, Dec. 8 (D.B.P.S.).

S. Frequently noted, Worlebury, Mar.–Apr. ; nest with three young, May 12 (R.A.). Single birds heard, Brockley Combe, May 17 (A.E.B.) and nr. Compton Bishop, June 18 (P.J.M.N.).

HOUSE MARTIN *Delichon urbica*

S. One with Sand Martins, Chew Valley res., on early date of Mar. 27 (B.K., N.W.).

SAND MARTIN *Riparia riparia*

S. Strong westerly movement, Blagdon res., Apr. 8; birds evidently arriving from Chew Valley, where enormous numbers, estimated at several thousands, were hawking over the water (G.L.B.).

RAVEN *Corvus corax*

G. Two at old decoy, Purton, various occasions, Oct. 15 to end of month (D.B.P.S.). Single birds, New Grounds, Oct. 2, Nov. 27 (B.K.).

S. Frequent records from Brean Down, Cheddar, Sand Point and Steep Holm, but no evidence of successful breeding except from Sand Point, where one young reared (R.A., H.R.H.L., T.B.S., *et al.*).

CARRION CROW *Corvus corone*

G. Count of 98, Avon mudbank, Sea Mills, July 7 (P.J.C.).

S. Counts of 130, Saltford sewage farm, Jan. 15; 105, Feb. 20; and 152, Nov. 26 (B.K.). Over 170 together, Nailsea Moor, May 29 (P.J.C.).

HOODED CROW *Corvus cornix*

G. Single birds nr. Dursley, early March (D.M.S.) and New Grounds, Oct. 2 (D.B.P.S.).

ROOK *Corvus frugilegus*

G. and **S.** The decrease, recorded in 1950, within the City and County of Bristol has continued: total of rookeries reduced from 12 to 4 and nests from 134 to 92. Boundary changes have excluded the Ham Green colony (53 nests), but included a colony of same size in Ashton Park (various observers). Up to 14 nests on electricity pylons, Uphill, Apr.–May (R.A., C.H., H.G.H.).

WILLOW TIT *Parus atricapillus*

G. Again reported from Stoke Gifford area where one seen and heard in hedgerow, Feb. 23 (H.H.D.)—for previous records cf. *Proc. B.N.S.*, 1947, p. 236; 1954, p. 43.

DIPPER *Cinclus cinclus*

G. Single ad., Little Avon River, nr. Alderley, Apr. 24 (D.M.C.). Pair, R.Boyd, Wick, throughout year and three juveniles present in June (D.R.H.). One, Abbey Mill, Kingswood (nr. Wotton-under-Edge), July 31 (D.B.P.S.).

S. Two nests, R.Chew (G.B.).

MISTLE THRUSH *Turdus viscivorus*

S. Local increase, Kewstoke, Jan.–Feb. (T.B.S.). Seven, arrived from N. and departed S.E., over Steep Holm, Nov. 14 (D.M.C., R.S.C.).

FIELDFARE *Turdus pilaris* REDWING *Turdus musicus*

G. Very strong N.E. movement, both species, Aust Cliff, Oct. 23, when approx. 10,200 birds recorded, 06.40–11.30 G.M.T., wind N.E., force 1–3 (D.M.C., P.J.C., R.S.C.).

S. Roost of *c.* 400 *T. musicus* in rhododendrons, Cleeve, Jan. 2 (A.G.D.).

RING OUZEL *Turdus torquatus*

G. Single male, Stinchcombe Hill, Dursley, Apr. 2 (D.R.H.).

STONECHAT *Saxicola torquata*

S. Breeding reported from Brean Down; also Sand Point, where pair reared two broods (R.A., W.L.R., T.B.S.).

REDSTART *Phoenicurus phoenicurus*

G. Adult male, Dodington on exceptionally early date of Mar. 30 (G.G.H.).

BLACK REDSTART *Phoenicurus ochruros*

G. Female or immature, Avonmouth Docks, Mar. 13 (R.H.P.).

S. Single females or immatures, Long Ashton Research Station, Apr. 13 (G.E.C.) ; Brean Down, Nov. 20 (M.A.W.).

WHEATEAR *Oenanthe oenanthe*

S. Again reported from Wavering Down area (W.L.R. *et al.*), where four pairs considered to have bred (P.J.M.N.). Pair believed to be breeding, Dolebury Warren, Churchill, May 21 (P.J.M.N.).

WOOD WARBLER *Phylloscopus sibilatrix*

G. Single bird heard, Damery, Apr. 24 (A.E.B.). One only, Dursley area, where six located in 1954 (D.R.H.).

S. Heard, Brockley Combe, May 17 (A.E.B.). Two, Budding's Wood, nr. Portbury, May 29 ; only five singing males, Leigh Woods, May–June—half usual number (P.J.C.). Only nine singing males located in area of *c.* 106 sq. kms. of Mendip Hills (from Weston-Blagdon and Cheddar-Churchill) : four, Cheddar Wood ; one, Batts Combe ; one, Long Wood, Cheddar ; one, Rickford Combe ; and two, Mendip Lodge Wood (various observers).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. Male, Dodington, mid-Apr., 1954 (G.G.H.).

S. Male, Clevedon, Apr. 21 (P.F.).

MEADOW PIPIT *Anthus pratensis*

G. Pair feeding newly fledged young nr. Sheperdine, June 5 ; second pair one mile N., but breeding not confirmed (R.H.P.).

ROCK PIPIT *Anthus spinoletta petrosus*

S. Single birds inland (presumably this race), Cheddar res., Jan. 9, Mar. 27 (B.K.).

WHITE WAGTAIL *Motacilla alba alba*

G. Of 50 or more *alba* wagtails on arable land and shore-line, Aust Cliff, Oct. 9, all those identified with certainty (8 birds) were White Wagtails (C.M.S.).

S. White (and/or Pied) Wagtails moving S.E. over Steep Holm, Oct. 16; 31 counted, 06.00–10.30 G.M.T. (R.H.P.).

GREY WAGTAIL *Motacilla cinerea*

S. One heard, Steep Holm, Oct. 16 (R.H.P.) and later seen (D.C.)—second record for the island.

YELLOW WAGTAIL *Motacilla flava*

G. An ad. and two juveniles (presumably *M.f. flavissima*) among large flock of *alba* wagtails, Aust Cliff, on late date of Oct. 9 (C.M.S.).

HAWFINCH *Coccothraustes coccothraustes*

G. One, Penpole Point, Shirehampton, Jan. 23 (P.J.M.N.). Up to four, Clifton and Durdham Downs, Feb. 12–Apr. 16, and seven, Feb. 19; at least three, same place, Dec. 17 (P.J.M.N., J.A.F.W.).

S. One, Brockley Woods, Apr. 25 (A.G.D.). Four or five pairs, Leigh Woods, Apr. 27 (P.J.C.).

GREENFINCH *Chloris chloris*

S. Up to 200 feeding on plateau, Steep Holm, Oct. 15; some departed in late afternoon, and on 16th, in direction of Brean Down; 60–70, same place, Nov. 14 (R.H.P.).

GOLDFINCH *Carduelis carduelis*

G. Late breeding records: nest with four newly hatched young, in apple tree, Sneyd Park, Aug. 25 (A.C.L.); nest with large young, also in apple tree, Filton, Aug. 12 (R.A.).

SISKIN *Carduelis spinus*

S. Party of 25 in Alders, Blagdon res., Feb. 12 (N.W.).

CHAFFINCH *Fringilla coelebs*

G. Of more than 3,700 migrating birds, Aust Cliff, Oct. 23, the great majority were moving N.E.—see also under Fieldfare/Redwing (D.M.C., P.J.C., R.S.C.).

BRAMBLING *Fringilla montifringilla*

S. Sixty with other finches, Chew Valley res., Dec. 18 (B.K.).

CORN BUNTING *Emberiza calandra*

G. Eleven (5 singing males), Tormarton—Acton Turville area, May 29 (R.H.P.). Two, Leighterton, and two Kingscote, July 13; single bird, Nympsfield, on 30th (D.B.P.S.).

S. Two singing males nr. Saltford golf course, June 4 (B.K.). Two nr. Yoxter, Mendip, July 31 (P.J.C.).

Cirl Bunting *Emberiza cirlus*

G. Single male, Penpole Point, Shirehampton, Oct. 30 (A.C.L.).

S. Ad. male, Hutton, June 28 (W.L.R.). Bred nr. Sand Point—pair with juvenile, Aug. 6 (T.B.S.) ; one, same place, Nov. 12 (H.R.H.L.).

Snow Bunting *Plectrophenax nivalis*

G. Male on river-bank between New Grounds and Frampton-on-Severn, Oct. 30 (D.B.P.S.).

LEPIDOPTERA NOTES BRISTOL DISTRICT, 1955

C. S. H. Blathwayt

(*Read in title to Council, May 3, 1956. Received Jan. 18, 1956.*)

THE first three months of the year were exceptionally cold but there was some fine and warm weather in April. May and June were both much colder than usual apart from some warm weather at Whitsun. By the end of June the season was still very backward, but the months of July and August were quite exceptionally fine and warm, and the weather continued to be dry until the late Autumn.

On the whole the year was a good one so far as the Lepidoptera were concerned and particularly for migrating species and was in fact a complete contrast to the previous year. As will be seen below the fine months of July and August provided some very interesting records for the area.

I am most grateful to Messrs. C. L. Bell (C.L.B.), G. H. W. Crutwell (G.H.W.C.), Dr. G. Hartill (G.H.), R. Henderson (R.H.) and K. H. Poole (K.H.P.) for sending me their records, some of which are included below with a selection from my own records (C.S.H.B.). All the Weston records are my own and all those from Frome are by G. H. W. Cruttwell. I have therefore omitted initials after records localized at these two places.

Euchloe cardamines Linn. (Orange-tip White). First seen April 14, Sodbury (G.H.) Scarcer than usual this year (C.L.B. and R.H.).

Colias croceus Fourc. (*edusa* Fabr.) (Common Clouded-yellow). Fairly common from early August to October, Weston Area. One in the middle of Bristol in August (R.H.).

Euphydryas aurinia Rott. (Marsh Fritillary). Larvae, Wickwar, Feb. 26 (C.L.B.)

Aglais urticae Linn. (Small Tortoiseshell). Abundant everywhere in August (C.S.H.B.). Recorded from March to December (C.L.B., G.H., R.H.).

Vanessa atalanta Linn. (Red Admiral). Very common in the Autumn, Bristol (C.L.B.).

Pararge megera Linn. (Wall Brown). Last seen Nov. 1st, Bristol (K.H.P.)

Acherontia atropos (Linn. (Death's-head Hawk). One freshly emerged female, Wells, Oct. 12 (G.H.W.C.).

Herse convolvuli Linn. (Convolvulus Hawk)—Seen at Hanham, Bristol, Sept. 7 and 8 (R.H.).

Celerio galii Rott. (Bedstraw Hawk). Four specimens at light, Weston, July.

Celerio lineata Fabr. (*livornica* Esp.) (Striped Hawk). One at light, Weston, Aug. 21.

Macroglossum stellatarum Linn. (Humming-bird Hawk). Fairly common this year, particularly in August and September, Weston and Bristol (R.H. and C.L.B.).

Cerura hermelina Goeze (*bifida* Hubn.) (Poplar Kitten). One at light, Weston, July 6.

Tethea ocularis Linn. (*octogesima* Hubn.) (Figure of Eighty). One at light, Weston, June 16.

Leucoma salicis Linn. (White Satin). One at light, Frome, July 10.

Lymantria monacha Linn. (Black-arched Tussock). At light, Weston, August.

Apatele alni Linn. (Alder Dagger). One at light, Frome, June 6.

Apatele rumicis Linn. (Dusky Knot-grass Dagger). Several melanic specimens at light, Weston, August.

Cryphia muralis Forst. (*par* Hubn.) (Marbled Vert). Common at light, Weston, July and August.

Agrotis trux Hubn. (*lunigera* Steph.) (Crescent Dart). Several at light, Weston, July.

Actebia praecox Linn. (Partland Dart). One at light, Weston, Aug. 12.

Eurois occulta Linn. (Great Brocaded Rustic). One at light, Weston, Aug. 21.

Triphaena interjecta Hubn. (Least Yellow-underwing). Several at light, Weston, July—August.

Polia nitens Haw. (*advena auctt.*) (Pale-shining Arches). Common at light, Frome, June—July.

Eumichtis lichenea Hubn. (Feathered Ranuncule). Common at light, Weston, September.

Eremobia ochroleuca Esp. (Dusky Sallow Rustic). One at light, Weston, Aug. 12.

Procus literosa Haw. (Rosy Minor). Several at light, Weston, July—August.

Apamea anceps Hubn. (*sordida* Borkh.) (Large Nutmeg). One at light, Weston, June 22.

Apamea scolopacina Esp. (Slender Brindle). One at light, Weston, Aug. 15.

Apamea ypsilon Borkh. (*fissipunta* Haw.) (Dismal Brindle). Several bred in July from larvae taken in May at Shapwick and Clevedon (C.S.H.B.).

Dasypolia templi Thunb. (Brindled Ochre). Four at light, Weston, October.

Hydraecia paludis Tutt (Saltern Ear). Several at light, Weston, July—August.

Hydraecia petasitis Doubl. (Butterbur Ear). Two specimens at light, Frome, Aug. 24 and Sept. 29.

Oria musculosa Hubn. (Brighton Wainscot). One at light, Weston, July 24.

Cosmia affinis Linn. (Lesser-spotted Pinion). Several at light, Weston, August.

Cosmia diffinis Linn. (White-spotted Pinion). Four specimens at light, Frome, Aug.—Sept. One at Weston Aug. 19.

Orthosia populeti Treits. (Lead-coloured Drab). Several at sallow, Clevedon, April (C.S.H.B.).

Atethmia xerampelina Hubn. (Centre-barred Sallow). Common at light, Weston, Aug.—Sept.

Cirrhia gilvago Esp. (Dusky-lemon Sallow). One at light, Weston, Oct. 14.

Heliothis dipsacea Linn. (Marbled Clover). One at light, Frome, July 11.

Heliothis peltigera Schiff. (Dark Bordered Straw). Several at light, Weston, June and August.

Plusia festucae Linn. (Gold Spot). Several at light, Weston, Aug. and Sept.

Plusia gamma Linn. (Common Silver Y). Very abundant July to November, Weston. Several dwarf specimens taken. First seen April 23.

Lygephila pastinum Treits. (Plain Blackneck). One at light, Frome, July 11.

Brephos notha Hubn. (Light Orange-underwing). Common round Aspen, Clevedon, April 11 (C.S.H.B.).

Sterrha dilutaria Hubn. (*holosericata* Dup.) (Silky Wave). Three specimens on Durdham Down, Bristol, July 11 (C.S.H.B.).

Lobophora halterata Hufn. (Large Seraphim). A few at light, Weston, May—June.

Philereme vetulata Schiff. (Brown Scallop). Several at light, Weston, July.

Philereme transversata Hufn. (*rhamnata* Schiff.) (Dark Scallop). Several at light, Weston, July.

Thera variata Schiff. (Grey Spruce Carpet). Two at light, Weston, Oct. 23.

Colostygia salicata Hubn. (Striped Twin-spot Carpet). One at light, Weston, Aug. 17.

Discoloxia blomeri Curt. (Blomer's Rivulet). Several at light, Weston, June and July.

Perizoma bifaciata Haw. (*unifasciata* Haw.) (Barred Rivulet). A few at light, Weston, July and August.

Perizoma taeniata Steph. (Barred Carpet). One at light, Weston, Aug. 6.

Nyctosia obstipata Fabr. (*fluviata* Hubn.) (Narrow-barred Carpet). Several at light, Weston, June, Aug., Sept. and Oct.

Eupithecia succenturiata Linn. (Bordered Pug). One at light, Weston, July 12.

Eupithecia fraxinata Crewe (Ash Pug). Several at light, Weston, Aug. and Sept.

Abraxas sylvata Scop. (Clouded Magpie). Common at light, Weston, June—July.

Semiothisa liturata Clerck (Tawny-barred Angle). Several melanic specimens taken at light, Weston, July.

Selenia lunaria Schiff. (Lunar Thorn). One at light, Frome, May, 26.

Apocheima hispidaria Fabr. (Small Brindled-beauty). Two at light, Frome, March.

Margaronia unionalis Hubn. (Scarce Olive-tree Pearl). Several at light, Weston, June, Aug. and Sept.

Zeuzera pyrina Linn. (Wood Leopard). Several at light, Frome and Weston, July.

W. D. CONYBEARE, HIS GEOLOGICAL CONTEMPORARIES AND BRISTOL ASSOCIATIONS

By F. J. North

(*Read to the Geological Section, March 17, 1956. Received Sept. 14, 1956.*).

WILLIAM DANIEL CONYBEARE was one of the band of pioneers that, in the early days of last century, helped to raise the study of rocks and fossils into the science of Geology. Long search for unpublished material that might serve as the basis for a biography has produced no more than a few letters[1] written to or received from De la Beche, Buckland, and Murchison, and these, together with his published works and references to him in the biographies of his contemporaries have been used in the preparation of the present paper.

Conybeare came of a family with long ecclesiastical associations. His grandfather (son of a vicar of Penhoe near Exeter) was Bishop of Bath from 1750–5, his father was Rector of St. Botolph's, Bishopsgate, whilst his brother John Josias was Rector of Batheaston and he himself, after holding a curacy at Chalcombe near Banbury and a lectureship at Brislington, became, in turn, Rector of Sully in Glamorgan, Vicar of Axminster, and Dean of Llandaff.

Early Days. Our only source of information about W. D. Conybeare's early life is a fragmentary autobiography written in a notebook in which he had preserved papers relating to one of his ancestors, an Elizabethan Schoolmaster, John Conybeare. (*1*)[2] From it we learn that he was not enamoured of autobiographies, which he described as being " absurd monuments of folly and affection, " the work of people who :—

> " Having angled all their life for fame,
> And getting but a nibble at a time,

sit down at last to *troll* with a heavy bait of autobiography. "

As a boy his health was not always good and his schooling was intermittent; this seems to have influenced his whole life, because, as a man, his geological work was curiously discontinuous. Many of those whose names became household words in the geological world acknowledged that they took their early steps under his guidance, but he never accepted a geological appointment, and whilst he helped to lay the foundations of geology, he did not, like Sedgwick at Cambridge and Buckland at Oxford or de la Beche as founder of the Survey, take a continuously active part in building the superstructure.

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[1] Most of them are now in the National Museum of Wales, where also there are copies of those still in private hands.

[2] See list of references on page 146.

Referring to his Bishopsgate days he tells us that he was "buried for nine months in the year in the old rectorial house . . . in a most ghoulish atmosphere in the middle of a churchyard," and he speaks of the " delight with which we hailed the return of our three summer months of emancipation, when we emerged into the free air and free fields of the country." This was when the family went to a small summer residence at Bexley in Kent. On these occasions his brother, John Josias, seems to have been almost his only companion. A favourite haunt was the group of Deneholes—ancient chalk pits—near Bexley, where he made collections of fossils from the sands exposed in shafts that gave access to the Chalk as well as from the Chalk itself.

In 1805 Conybeare entered Christ Church, Oxford, where he was able to live in comparative comfort due, as he wrote, to " The generosity of a worthy grandmother having at the time bequeathed me an annual income of £500." Of this, he recorded, " I spent £100 in the promotion of my library, another £100 I usually devoted to travelling . . . and English topography was my resource."

His topographical excursions took him into many parts of the country, and owing to the influence of that remarkable work, Stukeley's *Itinerarium Curiosum*, many of them had geological significance. Stukeley's *Itinerary*, he wrote, "first indicated to me many of the points of our physical geography, and the general course of our chalk hills . . . across our island. I also learnt how to trace the line of sands underlying the chalk escarpment, and the ranges of calcareous freestone from Bath, by the Cotteswolds."

To supplement Stukeley Conybeare had a copy of Christopher Packe's "New Philosophico-Chorographical Chart of East Kent," published in 1743. This was a remarkable map for its time because it depicted in considerable detail an area of about 32 square miles, indicating physical features by means of feather-like shading and the occurrence of chalk, stone, clay etc., by means of symbols. It was the nearest approach to a geological map that had by then appeared but it gave no information regarding the relationships between the rocks that were indicated and would be better described as a soil map. With Packe's map, he says, " I was taught to find a deeper interest in tracing out all the general relations in which the individual features of hill and dale combined . . . And the distinct organic remains of the several ranges became so familiar to me that I was prepared at once to seize the general fact of the successive distribution of those ancient genera when first laid down as an admitted fact in the progress of geology."

This was, of course, an allusion to the work of William Smith, and since others also were beginning to observe in these matters it shows how fortunate it was that Smith promulgated his views just when he did—at a time when there was a group of competent students ready to receive them.

Geological Excursions with William Buckland and Adam Sedgwick. In 1811 Conybeare became a Fellow of the Geological Society, then but four years old. In assessing the significance of that Fellowship we must remember that the Society was not then the body of experienced geologists that it is now. Its purpose, in the words of the resolution that brought it into being, was that of "making geologists acquainted with one another, of stimulating their zeal, and of ascertaining what is known in their science, and what yet remains to be discovered." That is still the purpose of the Society, but joining it now is not the venture into an almost unknown field that it was in Conybeare's day. Conybeare's first contribution to geological literature was a paper to the Society in 1814, *On the origin of a remarkable class of Organic Impressions occurring in Nodules of Flint.*(*2*) He described certain curiously rounded bodies found adhering to flat surfaces of flint and supposed them to represent the casts of cavities formed by parasitic animals that bored into various kinds of shells, the cavities having subsequently been filled with silica and the remainder of the shell dissolved away. His suppositions have since been amply confirmed and the structures recognized as the work of boring sponges *Cliona.* With the accumulated knowledge of more than a century behind us we sometimes fail to recognize the extraordinary perspicacity of those who made deductions like these for the first time.

Buckland joined the Geological Society in 1813, and in the same year he and Conybeare went geologizing in the north of Ireland. In a paper presenting the results of this tour to the Geological Society(*3*) the illustrations included a number of panoramic sketches showing the form and geological structure of the cliffs. This type of section was the forerunner of the "horizontal section" drawn to illustrate the geology of a district that is not dissected for long distances by sea cliffs or other natural exposures.

Towards the end of 1814 Conybeare left Oxford for a living in Suffolk, and Buckland wrote hoping that the "parsonage might prove to be founded on a bed of Elephants" no doubt because the fossil bones of large mammalia were already beginning to intrigue him. Conybeare does not, however, appear to have interested himself in the local geology, but the publication (in 1822) of his *Outlines of Geology*, to be mentioned later, shows that he kept himself well informed concerning current research.

In 1820 Adam Sedgwick came to Bath, where, as he recorded in a letter to Murchison, he received much kindness "from Mr. Conybeare, an Oxford Professor and a stone eater." This was W.D's brother John Josias, sometime professor of Anglo-Saxon at Oxford and then Rector of Batheaston. Interested in geology and mineralogy he had been elected an Honorary Member of the Geological Society at the time of its foundation in 1807. "After leaving Bath" continued Sedgwick, "I went to the Brislington house of Mr. William Conybeare, brother of the aforesaid Professor, who accompanied me in my expedition for three weeks" . . . In a letter thanking Conybeare for his help Sedgwick said, "I consider the acquaintance I have formed with you among the most fortunate and agreeable circumstances of my vacation."

Sedgwick placed great store upon this and subsequent excursions he made with Conybeare, and referred to him as "one of my earliest teachers in geology." Having regard to the part which Sedgwick subsequently played in the development of geology this record of his indebtedness to Conybeare is of more than passing interest. When Sedgwick secured the Woodwardian Chair of Geology at Cambridge in 1818 it was more by reason of his personal popularity than for his knowledge of the subject, of which he is reported to have said he then knew nothing at all. This was no doubt somewhat hyperbolical, but there is nothing to show that he had more than an amateur's casual interest. Like Dr. Watson, who secured the Professorship of Chemistry some fifty years before, he considered that his first task on assuming office was to qualify for holding it. With this object in view he travelled and thus came to meet Conybeare.

Also in 1820 Conybeare helped to found the *Bristol Institution for the Advancement of Science and Art*. In this he was aided by H. T. de la Beche, then about 24 years old and already beginning to take an interest in geology. They helped to further the development of the Institution's collections and assisted its Curator, J. S. Miller. Miller was a native of Danzig and when he wrote a memoir on the fossil crinoids which were abundant in the local Carboniferous Limestone, Conybeare agreed to edit it, because, he said, "since the author's native tongue is German the idiomatic inaccuracies might have obscured the sense to an English reader."

Work on Fossil Reptiles. It was whilst living at Bristol that Conybeare began to take an interest in the reptilian bones discovered from time to time in the Liassic rocks of Somerset, and in the early eighteen twenties we find him in frequent communication with H. T. de la Beche on the subject. The latter's home was then at Lyme Regis—also the home of Mary Anning, daughter of a cabinet maker who found it profitable to collect and sell the local fossils. Mr. Anning died when Mary was still quite a child, but she carried on the business with great success until her death in 1847. At a time when scientific interest in extinct reptiles was reaching a crescendo, she played a very important part by reason of her patience and skill as a collector. De la Beche had written about the Ichthyosaurs whilst Conybeare gave special attention to the long-necked Plesiosaurs, which he described in a paper published jointly with de la Beche in 1821.(*4*)

The early work on *Plesiosaurus* was done on somewhat fragmentary material, and Conybeare made several conjectures concerning those parts of the creatures not represented by fossils hitherto obtained, but in March, 1824, there came news that Miss Anning had discovered an entire skeleton. The story of this most opportune event can best be told by means of extracts from letters from Conybeare to de la Beche who was then in Jamaica, visiting the sugar plantations that were his family inheritance.

" Buckland, " wrote Conybeare, " paid me a visit which much hurried my actions, (and prevented my settling down to prepare my sermon), but he brought important news—that the Annings had discovered an entire *Plesiosaurus*, and that it had been offered to the Duke of Buckingham for £200, and that he (Buckland) in the course of a journey he was undertaking to Plymouth was requested to call at Lyme and conclude the bargain, if the specimen was really what it purported to be.

" I begged him to send me immediate intelligence, and three days afterwards I received a very fair drawing by Miss Anning of the most magnificent specimen which I shall shortly describe. It was the evening also of the meeting of our Phil. Socy., (The Bristol Institution) and you may imagine the fuss this occasioned—my sermon though finished in scraps was then not half transcribed, but one of my sisters-in-law who was staying with me kindly undertook that task, and to the Society I went, delighted . . . to pay that infant nursling of my own the Compt. of making this strange monster first known to the public through its means. Such a communication could not fail to excite great interest ; some of the folk ran off instantly (it was Friday evening), to the printing office, whither I was obliged to follow to prevent some strange blunders falling under the lash of my friend Cumberland. "

Even at that early date the public were eager for news of the unusual, and the Press was apt to flounder when reporting scientific discoveries—though it would be unfair to suggest that the Bristol Press was unique in that respect !

Our generation is either so familiar with the slabs of reptilian remains in museums or else quite unaware of their existence, that most people have either lost or never had the capacity to enjoy them through wonderment, and we find it difficult to realize that there was a time when they created as much press excitement as a flying saucer or a living coelacanth might to-day.

An important though somewhat exuberant memoir on the Ichthyosaurs and Plesiosaurs by Thomas Hawkins,(*5*) describes the recovery of a specimen that had been noticed by Mary Anning in the cliffs at Lyme. The account concludes:—"By next day's noon, twenty thousand loads of earth had been removed and a few minutes more sufficed to demonstrate the wonderful remains I tell of. Who can describe my triumph at the sight of the colossus. *My* eyes, the first which beheld it : who shall ever see them lit up with the same unmitigated enthusiasm again? And I verily believe that the uncultivated bosoms of the working men were seized with the same contagious feeling, for they and the surrounding spectators waved their hats to a hurrah that made the hill and mossy dell echoing ring"—and much more in the same strain.

A week after the Bristol meeting the anniversary meeting of the Geological Society was to be held, and Buckland asked Conybeare to go to London in order to receive the specimen. Being of considerable size it had been despatched by sea but was delayed for ten days or so, with the result that Conybeare had to be content to exhibit the drawing he had received from Miss Anning at a meeting of the Royal Society's Club. Although disappointed at the non-arrival of the specimen he was pleased to be the first to describe it because some of his previous conclusions had been questioned.

To de la Beche he wrote :—

" I made my Beast roar almost as loud as Buckland's Hyaenas, " a reference to Kirkdale Cave which Buckland had claimed as having once been a hyaenas' den, and to his experiments with living hyaenas to show that their feeding habits were similar to those of the animals that had occupied the cave.

Continuing, he said, " At last the important packet arrived, and after wasting a day in vainly attempting to move it upstairs to the room of meeting of the Geological Society [then in Somerset House] by the aid of two men, we were constrained to unpack it in the entrance passage : it is 10 feet in length and near 6 in breadth, imbedded in shale easily removed with a penknife. "

Several paragraphs are devoted to a description of the skeleton and to speculations upon the habits of the creature. " This creature must have been able to nibble with his head cheek by jowl with his tail. I suppose he swam on the surface and fished with his long neck, or lurked in shoal waters, hid amongst the weeds, pushing his nose to the surface to breathe, and catching all the small fry that came within reach of his long sweep ; but he must have kept as much as possible out of the reach of the *Ichthyosauri*, a very junior member of which with his long powerful jaws could have bit his neck in two without ceremony. "

The specimen was described in detail in a paper communicated to the Geological Society,(*6*) in which Conybeare summarized his views concerning the habits and habitat of the creature—views that later students have not found it necessary to alter in any important respect except in regard to the flexibility of the neck which was much less than Conybeare supposed.

In acknowledging Conybeare's account of the fine new fossil de la Beche wrote, " Yours containing an account of the fine specimen of *Plesiosaurus* I have just received . . . I must say that the brute's great length of neck very much surprised me ; however, I will not prose about what I never saw, but proceed to give some further account of the Geology of this part of the world . . . I had prepared two or three boxes of insects, and other matters to be sent to the Bristol Institution, but during my absence the ants had contrived to destroy everything. I have sent to a friend to try and get a long trunk of a Fern Tree for the Bristol Institution ; they are curious and will remind you of some coal plants, and who can say that there were not various species of fern trees in those days. "

From records which Dr. Wallis has kindly confirmed it appears that the specimens of tree fern were duly received at the Institution, also lizards, an alligator in spirit and some sea shells.

Just about this time (1824) his brother, John Josias, died and conveying the news to de la Beche Conybeare said, " this must, I fear, be the abrupt termination of our correspondence, for having lost the friend from whom I derived and with whom I shared all those pursuits which formed the basis of that correspondence, I have no heart to prosecute or think upon them just now... I feel therefore that I have no right, having nothing cheerful to communicate, to obtrude a correspondence of any other character . . . On the whole then, it is not likely that I shall write again, but I shall ever hear of or from you with satisfaction, and with still greater look forward to the period when we shall again meet in England. "

For a time, Conybeare disappeared from the geological world though he edited and published a volume of Anglo-Saxon poetry which his brother was preparing at the time of his death.

A Text Book—Outlines of Geology. When Conybeare again appeared in the geological world it was not fossil reptiles that engaged his attention, but before we discuss the new phase of his work we must go back to 1820 or thereabouts in order to consider one of his publications that played an important part in promoting the study of geology.

In 1818, William Phillips, a Quaker bookseller, who was interested in geology and was one of the founders of the Geological Society, published a small volume entitled *A Selection of Facts from the best authorities, arranged so as to form an Outline of the Geology of England and Wales.* Conybeare wrote to the author giving him additional information and pointing out errors that had crept into the work. Later on, Phillips suggested that Conybeare should edit a new and larger work, and as a result, the *Outlines of the Geology of England and Wales*, by W. D. Conybeare and W. Phillips, appeared in 1822. Most of the work had in fact been done by Conybeare and Phillips was reluctant for his own name to appear as a joint author.

The " Outlines " was the first really systematic work upon the Geology of England and Wales. It contained a brief and masterly summary of the rise and progress of geology, an elaboration of William Smith's idea that sedimentary rocks could be classified by means of the fossils which each successive layer contained, and accounts of the principal groups of strata recognized in the country, from the most recent down to the " Carboniferous "—a term which Conybeare himself introduced.

As an indication of the esteem in which the *Outlines of Geology* was held, we may take a tribute paid by Murchison, who, speaking of the days when he first began to pay attention to the study of rocks, said " Conybeare and Phillips *Geology of England and Wales* then became my scientific bible, and I saw that a fine field was open for any zealous and active searcher after truth in completing many gaps which they had left to be filled up. "

In 1828 Sedgwick suggested that he and Conybeare should collaborate in the preparation of the second part of the *Outlines*. To this Conybeare readily agreed, but Sedgwick seems to have found that the investigation of his Cambrian System demanded the whole of his energies, and Conybeare had neither the time nor the desire to take the initiative, for the volume was never issued : this is a pity, for had the available knowledge of the older rocks been recorded as methodically as that relating to the Secondary and Tertiary rocks had been recorded in the *Outlines* the dispute that led to the estrangement of Sedgwick and Murchison over the use of the terms Cambrian and Silurian might never have developed.

Coalfield Studies. Whilst living at Brislington, Conybeare made a close study of the neighbouring Coalfields, and in 1824 there appeared (in the Transactions of the Geological Society) a joint paper by himself and Buckland entitled *Observations on the South Western Coal District of England.*(7) This described the coalfields of Gloucester and Somerset in considerable detail and was for about fifty years the only description available. The map which accompanied it is evidence of careful and extensive fieldwork, and it was in this paper that the term ' dolomitic conglomerate ' for the basal or littoral Trias was first used.

In 1822 Conybeare was appointed Rector of Sully near Cardiff, a district that, geologically, has much in common with the country around Bristol, but he did not finally settle there until two years later. In October 1829 he was thrown from his gig and suffered severe concussion. It was at first thought that he would not recover, but in a few weeks Lyell, writing to John Fleming, was able to report that though he was still insensible there were hopes of a complete though slow recovery. A fortnight later J. S. Miller writing to de la Beche from the Bristol Institution said " The last account of about four days ago, through Dr. Prichard, from Mr. Conybeare is favourable ; he has been moved to Sully and his mind is unaffected, although nervous irritations are still visible. " At one time it was rumoured that Conybeare had succumbed, and in the 3rd. edition of his *Introduction to Geology*, Robert Bakewell expressed regret that "the Rev. W. D. Conybeare, is, unfortunately for the cause of science, deceased. "

Whilst at Sully, Conybeare studied the structure of the South Wales Coalfield, especially of its eastern end. Unfortunately the results were not published and his manuscripts do not appear to have survived, but a letter to Mr. Warburton, in 1830, for the information of the *Select Committee of the House of Commons on the Coal Trade*, contained an epitome of his conclusions which illustrate the extent and accuracy of his knowledge.

After describing the three fold division into an upper and a lower series with coal seams separated by Pennant Sandstone he wrote " I have one very important addition to make to Martin's description ; namely, that an anticlinal line, throwing up the beds, traverses a great part of it longitudinally . . . This anticlinal line is of mineral importance, because it either throws up, quite to the surface, the lowest shales, which are the principal seat of both the coal and iron ore, or it brings those shales throughout its course within attainable depth ; it has, therefore the effect of rendering this important part of our deposits accessible throughout a much greater extent than would otherwise have been the case. "

This is the first reference to a structural feature that has played a very important part in the exploitation of the coalfield. A section he drew to illustrate his interpretation of the strata was reproduced a few years later (1836) in Buckland's *Bridgewater Treatise.*

In 1834 Conybeare wrote to the *London and Edinburgh Philosophical Magazine* " On the probable future extension of the Coalfields at present worked. " He showed that the structure of the coalfields east of the Pennines was such that the Coal Measures passed southwards or eastwards beneath a covering of newer strata, so that coal seams might be expected to occur at workable depths beyond the edge of the Coal Measures in Yorkshire and Nottinghamshire. We are now so familiar with concealed coalfield exploration that it is useful to be reminded that someone had to enunciate the principle for the first time.

The Work of Rivers. Although from time to time Conybeare turned his attention to almost every aspect of geology he never lost his interest in matters pertaining to the development of rivers and the shaping of the earth's surface.

There were, at the time, two principal schools of thought. The adherents of one supposed that, as Hutton had taught, the forces now shaping the earth's surface were similar in nature and in degree to those which had operated to the same end throughout geological time—that valleys had been excavated by the normal action of the rivers that flow in them. The other school adhered to the older view that the features in question were largely, if not entirely, due to the violent movement of water at times when abnormal deluges had devastated the land.

Contributing to the discussion in a paper on the Valley of the Thames, read to the Geological Society in 1829, Conybeare described in detail the valley of the Thames and its tributaries, and concluded that the features presented by them could not in all cases have resulted from the action of the present streams. As an example of his reasoning, he pointed out that,

" The plains of London are covered with enormous accumulations of water-worn debris, chiefly of chalkflints, and . . . the gravel is not confined to the low grounds, but caps the highest summits of the district. To explain this distribution of this gravel by the operation of the actual rivers, . . . it is necessary, first, to suppose that an uniform plane originally existed from the summit of Highgate to the Hertfordshire chalk downs, and from the top of Shooter's Hill to those in Kent ; on the surface of which the rivers once flowed. Secondly, that these rivers have subsequently washed away all that immense mass of materials which would be requisite thus to reconstruct the surface. "

This was, of course, just what had taken place, but Conybeare attributed the phenomena to the action of great deluges. He weakened his case somewhat by suggesting that there had been at least three or four deluges, and when after the meeting Lyell wrote to Gideon Mantell, he said " The last discharge of Conybeare's artillery, served by the great Oxford engineer [i.e., Buckland] against the Fluvialists, as they are pleased to term us, drew upon them on Friday such a sharp volley of musketry from all sides and such a broadside at the finale by Sedgwick, as was enough to sink them for ever. "(*8*)

Attitude towards new ideas :—It is apparent from his interpretation of river terraces that Conybeare never quite managed to escape from the limitations imposed by the necessity for regarding The Deluge as a really important event in earth history and as typical of catastrophes that had from time to time occurred. For this reason he did not take kindly to some of the new ideas that inevitably resulted from the activity in field work that characterized the first half of the century. Two examples will serve to illustrate this—one relating to the increasing interest in cave faunas and the other to the glacial theory.

When Buckland explored Kirkdale Cave in Yorkshire and suggested that it had been, in ancient times, a hyaena den—thus implying the former existence in this country of animals now locally extinct, and of physical conditions completely different from those that now obtain—he was of course, severely criticized, and went to some pains to prove his contentions. There is nothing to show that Conybeare took an active part in the discussion, but he was not altogether inclined to take the new announcement seriously ; he drew a caricature of Buckland in the act of entering a cave, to the evident surprise of its fearsome occupants, and he wrote some facetious verses (containing reference to Buckland's conclusions) of which the following are examples :—

But of all the miraculous caves,
And of all their miraculous stories,
Kirby Hole all its brethren outbraves,
With Buckland to tell of its glories.

Ages long ere this planet was formed
(I beg pardon—before it was drowned),
Fierce and fell were the monsters that swarmed,
Roared, and rolled in these hollows profound.

" Mystic cavern," the gloom of the cell,
Shedding light on each point that was dark,
Tells the hour by Shrewsbury clock,
When Noah went into the ark.

By the crust on the stalactite floor,
The post-Adamite ages I've reckoned—
Summed their years, days, and hours, and more,
And find it come right to a second.

Though unwilling to accept Buckland's interpretation, of his finds Conybeare was always ready to assist in obtaining evidence and in 1832 he joined in the investigation of an " alleged Hyaena Den, " a cave that had been discovered in Caswell Bay, in Gower.

Conybeare never took kindly to the glacial theory when it was introduced into this country by Louis Agassiz and championed by Buckland.(*9*) After a lecture by Buckland in Oxford in support of Agassiz, Conybeare wrote, in the winter of 1840,—" Though sadly frost bitten at this moment I don't quite believe in the former Geological Supremacy of the Frost King—I am afraid I see reasons to prove the Universal prevalence of Glaciers *physically impossible*, and as Aristotle of old and an equally philosophical Poet of modern times has with infinite sagacity remarked ' What's impossible can't be—and never comes to pass. ' Then as to the evidence, you *see a few scratches* on the face of a rock and a heap of granite at its base —and then by an argument *per saltum* get at yr. Q.E.D. However it will make a *fine new slide in our raree show Geological Magic lantern* . . "

He summed his attitude up in a later letter :—" The Glacial Theory has always appeared to me a glorious example of hasty unphilosophical and entirely insufficient induction." It is apparent from their letters that the published writings of the pioneers give only a partial picture of their achievements. Fully to appreciate the contributions which they made it is necessary to know something of the thoughts they never published, and the breadth of vision they brought to bear on their work.

In 1836 Conybeare left Sully for Axminster, having spent in Glamorgan one of the happiest periods of his life. After this family responsibilities and official duties made such heavy claims on his time that he did not again take an active part in geological work. As we have seen he continued to correspond with some of his former collaborators and opponents—but almost the only thing he published was an account of the great landslide which took place on the coast west of Lyme Regis in the winter of 1839.

The summer and autumn of 1839 had been unusually wet, and early on Christmas morning an area some forty acres in extent began to slide towards the sea, producing a deep chasm about half a mile long, floored with the broken ground that had subsided. The effect of the landslide still continues to be one of the most interesting features of the neighbourhood.

It so happened that Buckland was spending Christmas at Lyme Regis and Conybeare was at Axminster, with the result that we do not have to rely upon the exaggerated reports of untrained and probably terrified observers for our knowledge of the catastrophe and the circumstances which led to its development. Conybeare and Mrs. Buckland made sketches, and the former wrote an account for publication in the *Philosophical Journal.*(*10*) He showed that the landslide was due to the fact that near the base of the cliff there was a bed of porous sandy material, (Upper Greensand) which rested upon impervious clay (the Lias). Since the strata were tilted in a seaward direction the surface of the clay constituted an inclined plane and when the percolating water had so far disintegrated the sandy bed as to render it incapable of supporting the material above (mainly chalk), the latter slumped bodily down the slippery slope upon which it rested. An illustrated account of the phenomenon was published in 1840.(*11*)

In 1845 Conybeare returned to Glamorgan as Dean of Llandaff, but the ruinous state of the Cathedral left him little time for geology except to apply his knowledge of stones to the choice of material for the restoration, which, as his gravestone records, "He carried out with Fond and Consistent Care."

Between 1850-1854 he made four visits to the Canaries and the Azores, largely on account of the health of his youngest son, and took the opportunity of visiting Teneriffe and other spots where volcanic phenomena could be studied, but he did not publish any of his observations.

He died in August, 1857, and his tomb is marked by the cross upon a tall shaft that stands near the Chapter House at Llandaff, that in spite of (or perhaps because of) its slenderness survived the bomb explosion that devastated the Cathedral in 1940.

Conybeare's Place in British Geology. At a time when Geology was struggling to emancipate itself from the encumbrance of the old cosmogonies and to establish itself on a truly scientific basis, the influence of a man like Conybeare was of incalculable importance, and it was in no small measure due to his own work that it was possible for him to write, in his *Outlines*, of finding " the scattered rays of information, which alone can be discerned previously, converging into a more condensed and steady light. "

There are other aspects of his work to which reference cannot be made in this short note. He undertook an examination, at the request of the British Association, of certain theories that de Beaumont had developed concerning the origin of mountains, and he engaged in a controversy with Lyell on the adequacy or otherwise of present causes to produce all the known geological phenomena.

He was too catholic in his interests to become a " specialist. " As his letters show, he seemed to be unable to follow for long one line of thought to the exclusion of others, and a piece of work once interrupted was seldom resumed. He was better as a collaborator than as a leader, and in many of the tasks he undertook jointly with others it was he that actually did most of the work. The account of the visit with Buckland to Ireland was drawn up by Conybeare and illustrated by sections which he had drawn. In the joint paper on *Ichthyosaurus* with de la Beche, the latter's contribution was principally that of keeping Conybeare informed concerning discoveries of new material—it was Conybeare who prepared the specimens and worked out the relationships of the bones. When he wrote, with Buckland, on the Coalfields near Bristol, it was he that lived in the district and knew it most intimately—it needed the stimulus of a collaborator to ensure the completion of the task and the publication of the results. When Conybeare failed to carry out *his* part of the design to write a second volume of the *Outlines*, the volume never appeared.

Some of his contemporaries influenced geological thought in a much more striking fashion because they concentrated upon a limited aspect of the subject and were thus able to add materially to the sum of knowledge and to establish new principles. William Smith, Sedgwick, Murchison, Lyell, de la Beche, and Buckland made geology their principal concern, but Conybeare was more attracted by the work of the Church. He never fully used his vast store of geological information in works published under his own name, but he was always ready to place it at the disposal of others.

His contribution was like that of the leven in the parable : its influence was far reaching but its identity was not separately maintained.

When his death was announced to the Geological Society by Major General Portlock, the President, he was described as being " indeed a patriarch of our science, one of those illustrious men who assisted at the very birth of Geology amongst us, one who was long looked up to, as a sure friend in the path of truth and science. "

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TYPE AND FIGURED SPECIMENS FROM THE TORTWORTH INLIER, GLOUCESTERSHIRE

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THE Lower Palaeozoic rocks of the Tortworth Inlier have long been noted for their rich fauna, and many specimens from these rocks are figured in various palaeontological works. The purpose of the present paper is to provide a list of these figured specimens, and to indicate, where possible, their horizons in terms of the recently established stratigraphical subdivisions (Curtis, 1955, pp. 3–6). In addition, notes are included on certain localities mentioned in early geological literature, for many of these are vague, and in some cases the names are not marked on the present day Ordnance Survey maps.

I wish to thank Dr. H. M. Muir-Wood and Dr. H. D. Thomas of the British Museum (Natural History), London (BM), Dr. C. J. Stubblefield of the Geological Survey Museum, London (GSM), and Mr. A. G. Brighton of the Sedgwick Museum, Cambridge (SM), for their aid in tracing the figured specimens.

1. Type and Figured Specimens

In the following list the Tremadoc species are dealt with together as they have been figured in two publications only. In the case of the Silurian forms the current name of the fossil is given first; information regarding the horizon and locality of the specimen is taken either from the label which accompanies it or from the museum register. Additions by the present writer are enclosed in square brackets.

a. *Tremadoc Series*

The type and figured specimens of Tremadoc age (GSM: 51524–31, 51533–5) are all from the Breadstone Shales of the Breadstone Shaft. They include the holotype (51529) and paratypes (51530–1) of *Niobe homfrayi* var. *smithi*, and the holotype (51534) of *Septadella jackmanae*. The following forms are figured by Stubblefield (1933, pp. 365–73, text-fig. 2; pl. 34, figs. 1–11): *Lingulella* cf. *lepis* (Salter), *Bellerophon* sp., *Agnostus calvus* Lake, *Beltella depressa* (Salter), *Niobe homfrayi* var. *smithi* (Stubblefield) and *Septadella jackmanae* Stubblefield. *Niobe homfrayi* var. *smithi* is also figured by Lake (1946, p. 333 ; 1942, pl. 46, figs. 2–3).

b. *Llandovery Series*

Rhizophyllum tortworthense Reed

SM : A 16607 (holotype) ; Upper Llandovery ; Middlemill, near Tortworth. *Rhizophyllum ? tortworthense* Reed, 1924, p. 29, pl. 3, fig. 7, 7a–c.

Stricklandia lens var. *ultima* Williams

GSM : GSb 4716 and GSb 4719 ; [Damery Beds], Upper Llandovery ; Woodford Green, near Tortworth (GSb 4716), and Avening Green, near Tortworth (GSb 4719). *Stricklandinia lens* Davidson, 1867, p. 161, pl. 19, fig. 17 (GSb 4716) and figs. 19–21 (GSb 4719).

Brachyprion compressus (Sowerby)

GSM : 11694–5 ; [Damery Beds], Upper Llandovery ; Damery Bridge, near Tortworth. *Strophomena compressa* Davidson, 1871, p. 315, pl. 46, figs. 7–8 (11694) and fig. 9 (11695). *Note :* one of the specimens figured by Davidson (1871, pl. 46, fig. 10) has not been traced. Bancroft (1949, p. 15) has suggested that the form of this species occurring in the Tortworth area should be regarded as a distinct variety.

Camarotoechia cf. *llandoveriana* (Davidson)

GSM : 13942 ; [Damery Beds], Upper Llandovery ; Damery Bridge, near Tortworth. *Rhynchonella Llandoveriana* Davidson, 1869, p. 184, pl. 24, fig. 12.

Camarotoechia weaveri (Davidson)

GSM : Geol. Soc. Coll. 6626b (holotype) ; [Damery Beds], Upper Llandovery ; Long's Quarry, Charfield. *Rhynchonella Weaveri* Davidson, 1869, p. 185, pl. 24, fig. 14, 14a.

Delthyris elevatus Dalman

GSM : 12084 ; [Damery Beds], Upper Llandovery ; Damery Bridge, near Tortworth. *Spirifera elevata* Davidson, 1867, p. 95 ; 1866, pl. 10, fig. 9.

Coelospira hemisphaerica (Sowerby)

GSM : 12051 ; [Damery Beds], Upper Llandovery ; Charfield Green. *Atrypa ? hemisphaerica* Davidson, 1867, p. 136, pl. 13, fig. 24, 24a–b.

Pterotheca avirostris Pitcher

GSM : 23114 (paratype) ; [Damery Beds], Upper Llandovery ; Damery Bridge, near Tortworth. *Pterotheca avirostris* Pitcher, 1939, p. 123, pl. 7, fig. 19.

Orthoceras subconicum (d'Orbigny)

GSM : Geol. Soc. Coll. 6857 (holotype) ; [Damery Beds], Upper Llandovery ; Michaelwood Chase, near Tortworth. *Orthoceras conicum* Sowerby, 1839, p. 642, pl. 21, fig. 21. *Orthoceras subconicum* Blake, 1882, p. 150, pl. 12, fig. 9. *Note :* the species was re-named *Orthoceratites subconicus* by d'Orbigny (1850, p. 2) when it was found that the name *Orthoceras conicum* was pre-occupied by an Upper Silurian form (Hisinger, 1837, p. 29, pl. 9, fig. 5).

Encrinurus onniensis Whittard

GSM : Geol. Soc. Coll. ρ42 ; [Damery Beds], Upper Llandovery ; Micklewood Chase, near Tortworth. *Calymene?? punctata* Murchison, 1839, p. 661, pl. 23, fig. 8a.

Dalmanites weaveri (Salter)

GSM : GSd 3154 (holotype), 19221 and 19223 (topotypes) ; [Damery Beds], Upper Llandovery ; Long's Quarry, Charfield. *Phacops Weaveri* Salter, 1849, p. 7, pl. 1, fig. 16 (GSd 3154). *Phacops Weaveri* Salter, 1864, p. 57, pl. 3, fig. 1, and pl. 4, fig. 6 (19223) and fig. 7 (19221). *Note :* Reed (1909, p. 69) considered that the original figure by Salter (1849, pl. 1, fig. 16) was based on three specimens (GSM : 19220–2), but Whittard (1938, pp. 132–3) has shown this to be incorrect.

c. *Wenlock Series*

Pycnactis mitratus (Schlotheim)

BM : R 25440–6 ; [*Pycnactis* Band], Wenlock ; Brinkmarsh Quarry, Whitfield. *Pycnactis mitratus* Ryder, 1926, p. 386, pl. 9, figs. 1–7. *Pycnactis mitratus* Smith, 1945, p. 53, pl. 34, fig. 4a–d.

Phaulactis glevensis (Ryder)

BM : R 25449–64 (syntypes) ; [*Pycnactis* Band], Wenlock ; Brinkmarsh Quarry, Whitfield. *Mesactis glevensis* Ryder, 1926, p. 391, pl. 9, figs. 9–18 (R 25449–58), and pl. 10, figs. 1–6 (R 25459–64).

Serpulites perversus M'Coy

GSM : GSb 4050 (holotype) ; [lower limestone], Wenlock ; Whitfield Quarry, Whitfield. *Serpulites perversus* M'Coy, 1853, p. 15, text-fig.

Philhedra siluriana (Davidson)

BM : BB 15034–6 (syntypes—three individuals attached to a single shell of *Strophomena waltoni* (Davidson)) ; Wenlock ; Falfield. *Crania Siluriana* Davidson, 1866, p. 82, pl. 8, figs. 19–20. Davidson, 1871, pl. 42, fig. 11.

Parmorthis basalis (Dalman)

BM : BB 15030–3 ; [*Pycnactis* Band], Wenlock; Falfield. *Orthis basalis* Davidson, 1869, p. 217, pl. 27, fig. 10 (BB 15030), fig. 10a–b (BB 15031), fig. 11 (BB 15032) and fig. 11a (BB 15033).

Strophomena waltoni (Davidson)

BM : B 5989 (holotype) ; Wenlock ; Falfield. *Leptaena Waltonii* Davidson, 1848, p. 317, pl. 3, fig. 6. *Leptaena Waltoni* Davidson, 1866, pl. 8, fig. 19. *Strophomena Waltoni* Davidson, 1871, p. 310, pl. 42, fig. 11, 11a–c. *Note :* accompanying the specimen is a label in Davidson's handwriting which reads " *Strophomena Waltoni* Dav., type (fig. specimen of *Lep. Waltoni* D. in Bull. Soc. Geol. de France, vol. v, 2nd ser., pl. iii, fig. 10) from the Wenlock Shales of Falfield, and given to me by my friend W. Walton Esq., 1860. On examining the specimen it has appeared to me that on it are attached 3 specimens of a *Crania* I had not seen before. " This label was apparently written before the specimen was re-figured in 1866 to show the attached shells of *Philhedra siluriana* (Davidson).

Camarotoechia borealis var. *diodonta* (Dalman)

BM : B 12919 ; [*Pycnactis* Band], Wenlock ; Falfield. *Rhynchonella borealis* var. *diodonta* Davidson, 1869, p. 174 ; 1867, pl. 21, fig. 23, 23a–b.

Whitfieldella canalis (Sowerby)

BM : B 5365 ; [*Pycnactis* Band], Wenlock ; Falfield. *Meristella ? didyma* Davidson, 1867, p. 112 ; 1866, pl. 12, fig. 8. *Whitfieldella canalis* Alexander, 1947, p. 311. *Note :* four of the specimens figured by Davidson (1866, pl. 12, figs. 3, 4, 4a–b, 6, 6a and 7) have not been traced with certainty, but fig. 3 is probably GSM : 12207, and fig. 6, 6a is probably GSM : 12211.

Actinoceras nummularium (Sowerby)

BM : C 3501 (holotype) ; [probably lower limestone or *Pycnactis* Band], Wenlock ; Whitfield Quarry, Whitfield. *Orthoceras Nummularius* Sowerby, 1839, p. 632, pl. 13, fig. 24. *Note :* Blake (1882, p. 161) regards the name *Actinoceras nummularium* as synonymous with *A. cochleatum* (Schlotheim).

Dalmanites sp.

GSM : 19389–90 ; [beds above upper limestone, Wenlock] ; Horseshoe Farm, near Whitfield. *Phacops Weaveri* Salter, 1864,

p. 57, pl. 3, fig. 2 (19389) and fig. 3 (19390). *Note :* Reed (1909, pp. 71–2) has shown the form to be distinct from *Dalmanites weaveri* (Salter).

Stromatolite

Bristol University : 10648 ; Wenlock ; Lower Shaft, Sturt Bridge, near Wickwar. Whittard and Smith, 1944, p. 71, pl. 3.

d. *Ludlow Series*

'Ceriopora' abnormis (Lonsdale)

GSM : Geol. Soc. Coll. 6547–9 (syntypes) ; Ludlow ; Purton. *Verticillipora? abnormis* Lonsdale, 1839, p. 693, pl. 16 bis., fig. 10, 10a–b (6547), fig. 10c (6549) and fig. 10d (probably 6548). *Ceriopora abnormis* Etheridge, 1888, p. 71.

2. NOTES ON CERTAIN LOCALITIES MENTIONED IN EARLY GEOLOGICAL LITERATURE

Avening Green. Most specimens from Avening Green were probably obtained from exposures of the Damery Beds near the old mill (280 yds. south of Whitehall Villa), or from loose material occurring at the northern end of the green and on the slopes near the Little Avon River.

Barber's Quarry. The map by Weaver (1824, pl. 39) shows that Barber's Quarry is the old working, now overgrown, situated 450 yds. W.30°S. of Brook Farm, and 340 yds. south-east of Falfield Mill. The limestone which was formerly exposed here is certainly in the upper part of the Wenlock succession, and is possibly a continuation of the upper limestone of the Whitfield area.

Charfield Green. Specimens from the Upper Llandovery labelled " Charfield Green " are mainly from the Damery Beds, but some may have been obtained from the fossiliferous base of the Tortworth Beds.

Crockley's Farm. A number of specimens in old collections, mostly from the *Palaeocyclus* Band, are labelled " West of Crockley's Farm. " Fossiliferous material from that horizon occurs in Daniel's Wood and in some old trenches 250 to 300 yds. west of the farm.

Cullimore's Quarry. Cullimore's Trap Quarry, which was marked by Weaver (1824, pl. 39), is situated 250 yds. north-east of Poolfield Farm, Charfield. The quarry is in the Upper Trap, but fossiliferous sediments, forming the base of the Tortworth Beds, occur in the north-western part of the quarry (Weaver, 1824, pl. 39, fig. 2 ; Murchison, 1839, text-fig. 98, p. 459 ; Reed and Reynolds, 1908, text-fig. 2, p. 515). The sedimentary rocks, which overlie the trap and fill irregular hollows in its upper surface, include highly fossiliferous ashy limestones and the *Palaeocyclus* Band.

Damery Bridge (*or Damory Bridge*). There are a number of small exposures near Damery Bridge, all of them in the Damery Beds, and much fossiliferous debris occurs in the neighbourhood. Most specimens in old collections were probably obtained from the small quarry, now completely overgrown, 50 yds. south-south-east of the bridge, or from the road cutting about 60 yds. south of the bridge.

Daniel's Wood. A considerable amount of material derived from the *Palaeocyclus* Band has been collected in the southern part of Daniel's Wood, particularly in the stream about 150 yds. E.30°N. of the south-western corner of the wood. Priest Hill Wood is an old name for Daniel's Wood, and it is marked as such on the Old Series one-inch Geological Survey map (sheet 35) and on the map by Sanders (1864, sheet 2).

Falfield. The majority of specimens shown as coming from the Wenlock rocks of Falfield were undoubtedly obtained from the workings on the eastern side of the Old Windmill ridge, and especially the quarry close to the windmill itself where the lower limestone and *Pycnactis* Band were formerly well exposed (Weaver, 1824, pp. 336–7 ; Murchison, 1839, p. 455).

Horseshoe Farm. The well-known road section immediately south-east of Horseshoe Farm is now overgrown. Calcareous sandstones and shales formerly exposed at this locality belong to the beds above the upper limestone ; these beds are considered by the writer to be of Wenlock age, but the fauna obtained from them has suggested Ludlow affinities to some geologists (Murchison, 1839, p. 455 ; Reed and Reynolds, 1908, pp. 524, 537).

Long's Quarry. Long's Quarry can be identified from the map by Weaver (1824, pl. 39) as the old overgrown pit in the Damery Beds, 150 yds. E.15°N. of Charfield Station.

Mickle Wood (*Michael Wood, Micklewood Chase or Michaelwood Chase*). Specimens obtained in Mickle Wood are mostly from the Damery Beds. Fossiliferous material derived from these beds occurs abundantly on the southern slope of the wood, particularly between Damery Quarry and the ford across the Little Avon River.

Middlemill Quarry (*or Horsley Quarry*). This quarry, situated 150 yds. east-north-east of the old Middle Mill, is in the Upper Trap. Sedimentary rocks are no longer visible *in situ*, but the lowest layers of the Tortworth Beds, including the *Palaeocyclus* Band, were once exposed on the northern side of the quarry (Weaver, 1824, p. 331 ; Reed and Reynolds, 1908, pp. 519–20), while material derived from the Damery Beds occurs on the southern side.

Ponting's Quarry. The strata exposed in Ponting's Quarry are those near the base of the Damery Beds. The quarry is situated 650 yds. south-east of Matford Bridge, and about 730 yds. W.37°N. of Woodfordgreen Farm ; its position is indicated on the map by Weaver (1824, pl. 39), and has been confirmed by Reed and Reynolds (1908, p. 521).

Purton Passage (*or Pyrton Passage*). The locality known as Purton Passage includes the area to the west-south-west of Tites Point where Ludlow and Downton beds are seen on the foreshore at low water. The rocks are situated between Cotterday Hole and the saltings to the west of the Berkeley Arms Inn, but have been partly obscured, since the days of Murchison and Phillips, by the accumulation of mud.

Skay's Grove (*or Skeay's Grove*). The lower limestone of the Wenlock has been quarried at a number of points in and near Skay's Grove, and the *Pycnactis* Band is exposed in an old quarry at the extreme northern end of the wood.

Whitfield. The chief fossil localities in the Wenlock rocks of the Whitfield area are Brinkmarsh Quarry and Rifle Cottage Quarry, both of which display the lower limestone and the *Pycnactis* Band. Whitfield Quarry, described by Weaver (1824, p. 337), is apparently the same as Brinkmarsh Quarry, for a quarry approximately coinciding in position with the latter is marked on his map (pl. 39).

Woodford Green. Much fossiliferous material derived from the Damery Beds occurs in the neighbourhood of Woodford, and the majority of specimens labelled " Woodford Green " and " Woodford Hill " are from those beds. Woodford Hill is shown on the Old Series one-inch Geological Survey map (sheet 35) as being situated to the west and north-west of Woodfordgreen Farm, but the name has probably been used to include a considerable area bounded to the south and west by the valley of the Little Avon River.

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MINING AND QUARRYING IN THE BRISTOL DISTRICT, 1955

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Introduction

THE purpose of this note is to place on record the quarries, mines and pits which were in active operation at the time of the British Association meeting in Bristol in 1955 for purposes of comparison with the record for the previous meeting (Burrows, 1930). Summaries of the geology or economic geology of the district have been recently given by Kellaway and Welch (1948), Loupekine (1954) and Curtis, Donovan, Kellaway and Welch (1955); lists of local quarries have been compiled by Rogers (1948) and the Quarry Managers' Journal (1954–55). An indexed map, which is based on the quarter-inch sheet of the Geological Survey (1955), is included and may form a useful guide in the planning of excursions.

General Description

By virtue of a remarkable representation of geological formations, which extends from the Cambrian to the Chalk, within a radius of a little over twenty miles, the Bristol district provides a wealth of industrial geological products of economic importance. The industrial resources may be treated under the five headings:—stone, sand and gravel, coal, clay, mineral products. Water supplies are considered to be outside the scope of this paper.

1. *Stone.* In the past the district was famous for its production of building and decorative stones (Reynolds, 1924) which were worked by hand. The present changed economic conditions and increased building requirements have led, however, to the development of a thriving industry operating large, mechanised quarries which are worked mainly for roadstone and concrete aggregate, building stone, and lime and powdered limestone. No fewer than 70 quarries or groups of quarries are in active operation, mostly in the limestones of the Carboniferous Limestone Series, but also in Silurian andesite, subsidiary sandstone bands in the Carboniferous Limestone Series, sandstones of the Coal Measures, and Mesozoic

limestones (White Lias, Lias, Inferior Oolite and Great Oolite Series). One notes the decline in the production of Pennant Sandstone and the Lias and Inferior Oolite limestones : of the building stone quarries, only those for Bath Stone and Doulting Stone continue to be successfully exploited.

In general, the rocks of the older formations are more useful for roadstone and concrete aggregate on account of their hardness and compactness ; the rocks of the newer formations are more suitable as building stones. The purer limestones from both series are used for lime-burning and for making agricultural powder ; other by-products include sand and sandstone, poultry grit, ornamental stone, and concrete blocks and similar products.

2. *Sand and Gravel.* Local supplies of sand and gravel are obtained mainly from river deposits by dredging or digging operations. Permanent pits are rare and such supplies are derived from time to time only on a limited scale. Thus the river terrace gravels at Stidham Farm, near Saltford, were in recent exploitation ; sands of the Cotswold Sand are at present worked at Bitton for foundry purposes.

3. *Coal.* The Bristol and Somerset Coalfield forms several detached or semi-detached basins and differs from most other coalfields in that owing to concealment by younger strata which give rise to fertile soils and a varied scenery, it offers a pleasant countryside that is not usually associated with coal-mining areas. The coals are mainly bituminous with strong coking properties, and about eighty per cent of the production is taken by the Central Electricity Authority and the gas industry ; the remainder is used by local industries and for household purposes.

In the Regional Survey Report on the Bristol and Somerset Coalfield (1946), the workable reserves of coal were estimated at about 150 million tons, and in the 15-year plan of the National Coal Board (1950), the importance of the regional situation of the coalfield was recognised, and every effort is being made to increase production by deep mining by modernised methods and the discovery of new seams by further surveys (Evans, 1954, 1955).

There are at present nine coal-mines in operation in the Bristol district. Eight of the mines are situated in the Pensford and Radstock areas in the Somerset Coalfield ; the ninth mine is the new Harry Stoke Drift Mine, on the north-eastern boundary of Bristol. Coalpit Heath, which closed in 1949, was the last of the old collieries of the Bristol Coalfield.

4. *Clay.* Clays are worked from a number of large pits in the Bristol district. Household bricks, tiles and pottery are made from clays of the Trias and Gault formations and Recent alluvium ; high quality engineering bricks, pipes and similar ware are made from

Coal Measures clays. Several of the old Coal Measures clay pits in the Kingswood area have recently closed down.

Apart from Fuller's Earth, which is considered separately, some of the clays are used in chemical industry, as for example the Lower Lias clays at North Wick and the Recent alluvium clays at Portishead.

5. *Mineral Products.* The mineral products of the area include iron ochre, celestine and Fuller's Earth.

(*a*) Iron ochre is extracted from the Trias deposits at Wick and Winford. The material includes both yellow and red ochre and is used in the preparation of pigments.

(*b*) Celestine deposits are worked from the Trias formation in the Yate-Wickwar area which annually produces the bulk of the world's output of strontium. The product is of exceptionally high quality (usual content of strontium sulphate, 95–96 per cent) and it has a number of industrial applications, especially in the manufacture of flares, rockets and tracer-ammunition ; the Yate strontium sulphate is no longer used in the sugar-beet industry.

(*c*) Fuller's Earth is mined at Combe Hay, south of Bath, The rock is more calcareous than that of Surrey and most of the production is utilised as a bonding in moulding sands.

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A. Iron ochre

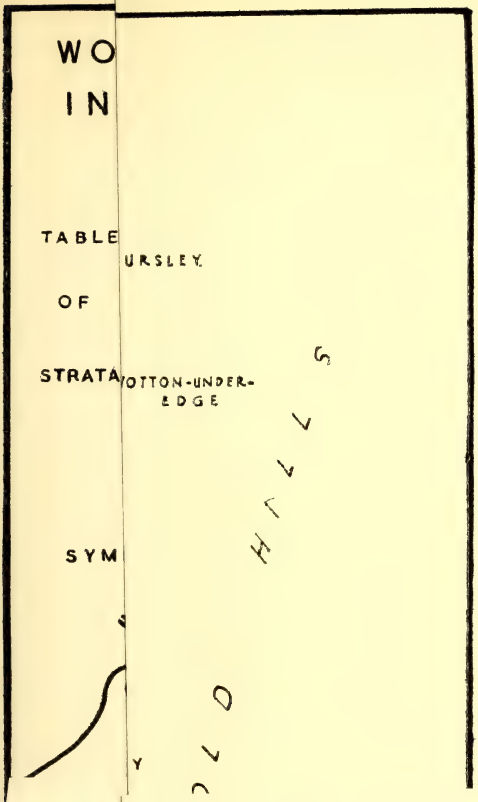
100. Ochre Mine & Works, Wick. Golden Valley Colours Ltd. *Yellow ochre.*
101. Redhouse Farm quarry, Winford. Winford Iron Ore & Redding Co. Ltd. *Red ochre & iron oxide.*

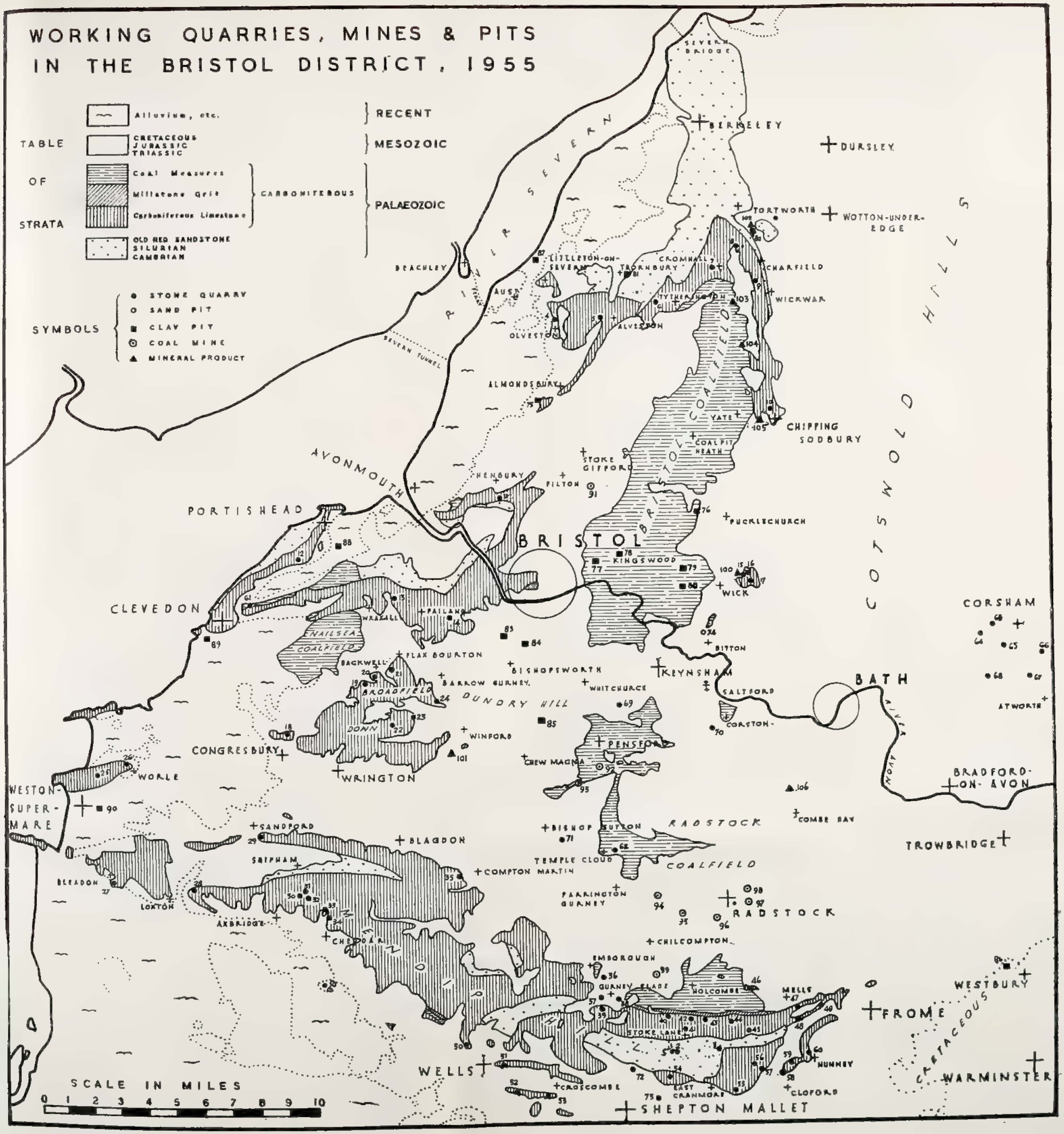
B. Celestine

102. Tortworth Estate pit, Charfield. Bristol Mineral & Land Co. (per G. H. Downing & Co.).
103. Barber's Court pits, Wickwar. Bristol Mineral & Land Co.
104. Hall End Farm pits, Yate Court. Bristol Mineral & Land Co.
105. Wapley Depôt pits, Yate. Bristol Mineral & Land Co.

C. Fuller's Earth

106. Combe Hay Mine & Works, Bath. Fuller's Earth Union Ltd.


WO
IN
TABLE
OF
STRATA
SYM
URSLEY
OTTON-UNDER-EDGE
LD HILLS
Y



WORKING QUARRIES, MINES & PITS IN THE BRISTOL DISTRICT, 1955

TABLE OF STRATA
Alluvium, etc.
RECENT
CRETACEOUS
JURASSIC
TRIASSIC
MESOZOIC
Coal Measures
Millstone Grit
Carboniferous Limestone
CARBONIFEROUS
PALAEOZOIC
OLD RED SANDSTONE
SILURIAN
CAMBRIAN
SYMBOLS
● STONE QUARRY
○ SAND PIT
■ CLAY PIT
◎ COAL MINE
▲ MINERAL PRODUCT
SCALE IN MILES
0 1 2 3 4 5 6 7 8 9 10
RIVER SEVERN
SEVERN BRIDGE
SEVERN TUNNEL
BERKELEY
DURSLEY
TORTWORTH
WOTTON-UNDER-EDGE
BEACHLEY
AUST
LITTLETON-ON-SEVERN
THORNBURY
CROMHALL
CHARFIELD
TYTHERINGTON
WICKWAR
OLVESTON
ALVESTON
ALMONDSBURY
BRISTOL COALFIELD
YATE
CHIPPING SODBURY
COALPIT HEATH
COTSWOLD HILLS
STOKE GIFFORD
AVONMOUTH
HENBURY
FILTON
PORTISHEAD
PUCKLECHURCH
BRISTOL
KINGSWOOD
WICK
CLEVEDON
WRAXALL
FAILAND
CORSHAM
NAILSEA COALFIELD
FLAX BOURTON
BITTON
BACKWELL
BISHOPSWORTH
KEYNSHAM
BARROW GURNEY
WHITCHURCH
SALTFORD
BATH
BROADFIELD
DUNDRY HILL
ATWORTH
DOWN
WINFORD
CORSTON
RIVER AVON
CONGRESBURY
PENSFORD
WORLE
CHEW MAGNA
WRINGTON
BRADFORD-ON-AVON
WESTON-SUPER-MARE
COMBE HAY
SANDFORD
BLAGDON
BISHOP SUTTON
RADSTOCK COALFIELD
TROWBRIDGE
SHIPHAM
TEMPLE CLOUD
COMPTON MARTIN
BLEADON
LOXTON
FARRINGTON GURNEY
AXBRIDGE
RADSTOCK
MENDIP HILLS
CHEDDAR
CHILCOMPTON
EMBOROUGH
GURNEY SLADE
HOLCOMBE
MELLS
WESTBURY
FROME
STOKE LANE
CRETACEOUS
WELLS
NUNNEY
WARMINSTER
CROSCOMBE
EAST CRANMORE
CLOFORD
SHEPTON MALLET

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GEORGE FORSTER BURDER	80— 83
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Professor WILLIAM RAMSAY	84— 87
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Professor ADOLPH LEIPNER	93— 94
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G. C. GRIFFITHS	17— 18
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H. WOMERSLEY	22— 23
Professor O. V. DARBISHIRE	24— 26
JAMES RAFTER	27— 29
A. L. FLEMMING	30
J. W. TUTCHER	31— 32
F. S. WALLIS	33
Professor O. V. DARBISHIRE	34
G. E. J. McMURTRIE	35— 37
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Professor W. F. WHITTARD	52— 53
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R. BASSINDALE	56—

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At the end of Vol. IX publication in series ceased and the next volume, the twenty-seventh since publication started, is numbered XXVII.

Vol. XXVII. Pt. 1 (1944), Pt. 2 (1945), Pt. 3 (1946), Pt. 4 (1947), Pt. 5 (1948).
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In addition, limited stocks of some parts of earlier volumes are held, viz. 2nd Series, 1866-1872, and New Series (3rd), Vols. I to X, 1873-1903. Particulars of parts available can be obtained from the Honorary Librarian.

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1956

PROCEEDINGS

OF THE

Bristol Naturalists' Society

EDITED BY SCOTT SIMPSON
ASSISTED BY A COMMITTEE

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DEC 31 1957
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Issued 30*th, August* 1957

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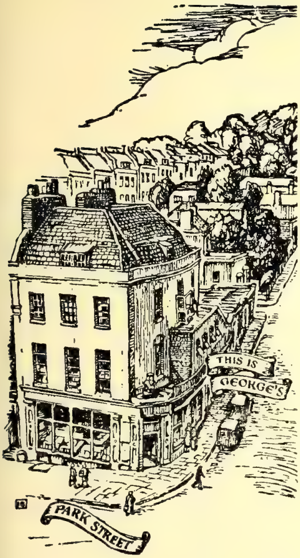

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1. All matter offered for publication in the " PROCEEDINGS " must be sent as directed on p. 2 of cover of current issue.
2. To ensure consideration for inclusion in the next issue, contributions must be received not later than February 28.
3. All copy must be type-written (preferably double-spaced) or in very clear manuscript and, in either case, with good margins.
4. Copy submitted is not returnable and authors are advised to keep a duplicate.
5. At the discretion of the Hon. Editor, contributors may be required to furnish short abstracts of their communications, for printing as summaries.
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DEC 1 3 1957

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1956

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C.	Crutwell, G. H. W.	Old Ford House, Frome, Som.
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REPORT OF COUNCIL

1956

THE membership of the Society now stands at 555 with 13 Affiliated Societies, making an increase of 110 members over 1955. The membership of the Junior Section, founded in November 1955, now stands at 88.

At the Annual General Meeting the Officers and Members of Council were duly elected with Mr. R. Bassindale as President succeeding Mr. Harry Savory, who, in retiring, gave his Presidential Address entitled ' The Island of Steep Holm '.

Each month throughout the year, both General and Sectional meetings were held as well as a number specially arranged for the Junior Section.

A series of Presidential Lectures was arranged to be given by Mr. Bassindale during his term of office to Affiliated Societies. At these lectures all members were welcome.

The Annual Dinner at which there was an attendance of 82 was held on March 23rd in the Senior Common Room of the University by courtesy of the Members. The Guest Speaker was Professor MacGregor Skene who spoke on ' The Progress of a Discovery '.

The Society learned of the Knighthood conferred on Professor A. G. Pugsley with great satisfaction.

The deaths of Mr. E. E. Allen and Mrs. C. R. Burrough were noted with much regret.

C. S. CARLILE, *Hon. Secretary.*

NOV 2

HON. LIBRARIAN'S REPORT

1956

THE library continues to be used regularly, 260 books being borrowed during the course of the year. Our very good collection of periodicals proves to be of inestimable value to those of us (and other Museums) who wish to refer to back papers or keep up with recent advances in the specialised branches of these sciences. We have replaced a number of missing volumes and we have received some gifts of reference works and acquired some new journals on an exchange basis for our own publication. The catalogue now needs a complete overhaul and this will take time so that members will perhaps bear with patience such inconveniences as will be caused necessarily until this is done. Some new books (mostly Collins New Naturalist Series) have been added. We shall soon come to the end of the money set aside (from the sale of Journals) for rebinding and thus we shall be back on our grant of £20 a year only for new books and general expenses. This will mean the addition of a very limited number each year so that if any member feels he would like to make an occasional gift of a suitable current book, it would be received with gratitude and would help to maintain the standard of our very good collection.

J. H. DAVIE, *Hon. Librarian.*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

RECEIPTS AND PAYMENTS FOR THE YEAR ENDING 31 DECEMBER, 1956

Dr.

1955 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	To Members' Subscriptions :—				
4 0 0	Full Members	1954	– – –		
250 2 6		1955	1 0 0		
11 10 0		1956	264 12 6		
1 0 0		1957	5 0 0	270 12 6	
26 0 0	,, ,, of	1955	10 0		
1 10 0	the same household	1956	27 10 0		
		1957	5 0	28 5 0	
31 3 0	Country members	1955	– – –		
1 10 0		1956	32 13 0		
		1957	10 0	33 3 0	
4 0 0	"Old" Associates	1955	– – –		
		1956	2 12 0		
		1957	7 0	2 19 0	
9 2 6	"New" Associates	1955	5 0		
1 0 0		1956	6 12 6		
		1957	2 6	7 0 0	
13 0 0	Affiliated Societies	1955	– – –		
1 0 0		1956	12 0 0	12 0 0	
	Junior Section	1956	19 5 0		
		1957	10 0	19 15 0	
354 18 0					373 14 6
	,, Sales of Publications :—				
5 10 6	Separates and Covers ..		6 16 6		
2 7 6	Bird List		– – –		
2 10 0	Subscribers		2 10 0		
2 0 0	General Publications ..		2 10 0		
1 7 6	Vaughan's "Avon Gorge"		14 0	12 10 6	
– – –	,, Profit on Dinner				1 11 0
20 2 1	,, Interest on Deposit in Post Office Savings Bank ..				17 8 5
388 15 7					405 4 5
807 15 0	,, Balances from last Account				608 5 9
1,196 10 7					£1,013 10 2

A. H. PEACH, *Hon. Treasurer*,
21 January, 1957.

Cr.

1955 £ s. d.		£ s. d.	£ s. d.
	By Subscriptions :—		
1 1 0	Ray Society	1 1 0	
2 7 0	S.W. Naturalists' Union	2 16 0	
1 1 0	Mammal Society	1 1 0	4 18 0
189 2 8	,, *Proceedings* (1955)		233 1 8
19 13 2	,, Stationery	19 18 11	
50 17 3	,, Printing	39 3 6	59 2 5
	,, Postages, etc.		
	Hon. Secretary and Assistants ..	44 17 8	
	Hon. Treasurer	5 3 10	
	Hon. Editor	12 9	
	Hon. Librarian	1 0 0	
39 3 5			51 14 3
3 15 0	,, Fire Insurance (Library)		3 15 0
10 9 6	,, Books and Periodicals		14 8 0
1 0	,, Rent (use of Library Room)		1 0
9 0	,, Bank Charges		8 0
24 0 3	,, Fares and Expenses of Meetings		12 13 2
6 0 0	,, Clerical Assistance (issue of Circulars, etc.)		6 0 0
6 6	,, Field Committee : Expenses		10 19 3
182 3 7	,, Book-binding		210 15 6
	,, Grants to Sections :—		
10 0 0	Botanical	– – –	
3 5 0	Entomological	10 0 0	
15 0 0	Geological	20 0 0	
15 0 0	Ornithological	15 0 0	
– – –	Junior	5 0 0	50 0 0
4 10 0	,, Rent : Steep Holm		– – –
	,, Special Expenses :—		
1 19 6	Framing Notice of Society		– – –
8 0 0	Replacing Zoo Record Number ..		– – –
588 4 10			657 16 3
	,, Balances to next Account :—		
123 12 4	Cash at Bank	127 10 7	
451 12 6	Deposit in Post Office Savings Bank ..	208 14 9	
		336 5 4	
10 18 3	Cash in hands of Field Secretary ..	9 19 0	
22 2 8	Cash in hands of Secretaries	9 9 7	355 13 11
1,196 10 7			£1,013 10 2

Audited and found correct,
F. W. EVENS, *Hon. Auditor*,
Bristol, 21 January, 1957

REPORT OF BOTANICAL SECTION

1956

AT the Annual Business Meeting, held on January 16, Mr. I. W. Evans was elected President and Mr. A. G. H. A. Sargent, Hon. Secretary. The retiring Hon. Secretary, Mrs. H. H. Davis, who has served the Section for the past seven years was later presented with a book-token in appreciation of her work. Unfortunately Mr. Sargent was unable to continue as Secretary and at the end of the year these duties were taken over by Mr. R. F. Wills. Committee members elected were: Mrs. H. H. Davis, Mrs. G. S. Wakefield, Miss D. Shaw, Dr. A. F. Devonshire and Mr. F. W. Evens.

During the year Dr. Devonshire with help from Dr. Willis, Mr. C. H. Cummins and Mrs. Wakefield, with isolated contributions from other members, continued the scheme for mapping the British flora organised by the Botanical Society of the British Isles. At the end of the year the numbers of species recorded in the respective Squares for the Bristol District were: Square 31/57, 541; Square 31/56, 368; Square 31/66, 409. Our thanks are due to all those who have helped in this important work.

The table of wild flowers at the Bristol Museum has again been much appreciated by visitors. Our thanks go to Dr. Wallis and Mr. Bird of the Museum and to Mrs. Wakefield and Mr. Evens and other members who have contributed specimens.

During the year the following Winter Meetings were held

Jan. 16: Annual Business Meeting. C. H. Cummins—Some plants of the Central Alps.
Feb. 20: D. L. Abbott—The apple seed in relation to fruit growth and development.
Mar. 19: Miss Dutton and Miss Pring—Experiments on the distribution of seven rare species of the Bristol area.
Oct. 22: L. C. Luckwell—A journey across America.
Nov. 19: J. A. Eatough—The photography of flowers in colour.
Dec. 17: A. F. Devonshire—British poisonous plants.

The following field-walks took place during the spring and summer under the leadership of those named:—

Apr. 28: Claverton Down and Bath Botanical Gardens: A. F. Devonshire.
May 12: Pensford, Lord Wood and Woolard: I. W. Evans.
May 18: Clevedon: A. F. Devonshire.
May 29: Whitchurch to Keynsham: I. W. Evans.
June 16: Batcombe: Mrs. F. A. Dowding.
June 26: East Harptree: T. H. Payne.
May 10: Mrs. Luke's Garden: Mrs. G. S. Wakefield.
May 21: Camerton Old Railway: Miss D. Shaw.
Aug. 14: Left Bank, River Avon: Mr. and Mrs. R. F. Wills.
Aug. 25: Dodington Park: G. Garlick and I. W. Evens.
Sept. 15: Cardiff Museum: Mrs. G. S. Wakefield.

During the summer months five indoor meetings were held to which members brought specimens for identification. A visit was made to the Hyatt Baker Botanical Gardens and Mr. I. W. Evans conducted a tour of bombed sites to study their flora.

R. F. WILLS, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION

1956

AT the Annual Business Meeting held on January 6, Mr. Norman A. Watkins was re-elected President and Mr. C. L. Bell Secretary.

There were five indoor meetings during the year, as follows :—

Feb. 7 : Talk by Mr. R. Bassindale on " The basis of genetics in Lepidoptera ".

Mar. 6 : Talk by Dr. H. E. Hinton on " Caste determination in social insects ".

Oct. 9 : Films—Blowfly and Mosquito. Commentary by Dr. H. E. Hinton.

Nov. 6 : Annual Exhibition.

Dec. 4 : Films—The Dance of the Bees. Commentary by Mr. R. Bassindale.

On June 9, the section had an enjoyable field meeting at Inglestone Common, Wickwar, in spite of poor weather.

CECIL E. BELL, *Hon. Secretary.*

REPORT OF GEOLOGICAL SECTION

1956

AT the Annual Business Meeting held in the Department of Geology, The University, on January 17th the following officers were elected:—President, Mr. F. Stenhouse Ross ; Vice-President, Dr. F. Coles Phillips ; Hon. Secretary, Dr. R. J. G. Savage ; Hon. Field Secretary, Mr. J. W. Cowie, Committee, Prof. W. F. Whittard (*ex officio*), Mrs. M. M. Perkins, Mrs. G. S. Wakefield, Dr. M. L. K. Curtis, Mr. V. D. Dennison, Mr. T. R. Fry, Mr. F. J. W. Holwill, Mr. C. E. Leese, Dr. I. S. Loupekine, Dr. S. Simpson, Mr. H. W. Turner. Mr. A. C. K. Fear was elected in February to fill a vacancy on the Committee.

The Section held five indoor meetings during the year. A programme of geological films was shown in March and the following lectures were given:—

Jan. 17 : Dr. J. S. Webb (London). ‘ Geochemical Prospecting ’.
Feb. 16 : Dr. R. J. G. Savage (Bristol). ‘ Kenya Safari ’.
Oct. 16 : Mr. I. H. Ford (Bristol). ‘ The Age of the Earth ’.
Nov. 22 : Prof. L. S. Palmer (Wells). ‘ Man’s Journey through Time ’.

During the summer the following field excursions were arranged :—

Apr. 21 : Leader Dr. Curtis. Tortworth area.
May 12 : Leader Dr. Simpson. Lyme Regis.
June 6 : Leader, Mr. Ross and Mr. Leese. Stockwood Estate, Whitchurch.
July 7 : Leader, Mr. Fry. Twerton, nr. Bath.
Aug. 15 : Leader, Mr. Ross. Dundry Quarry.
Sept. 8 : Leader, Dr. Wallis. Clevedon district.

The ‘ I. S. Loupekine ’ Fund was initiated by the President, Mr. F. Stenhouse Ross, supported by Mrs. Perkins, Messrs. Beacham, Leese, Marsden and Shinner, with the object of presenting to Dr. Loupekine a token of the esteem and thanks for his long and faithful services to the Geological Section. Members responded very well to the appeal and Dr. Loupekine was presented before leaving for Nairobi with a pair of binoculars, which contained an inscription recording the presentation.

Field work at Dundry, under the leadership of Mr. Ross, continued, and further progress was made in re-exposing the old quarry in the Oolites. Arrangements are well advanced for a further period of active digging.

The following resignations from the Committee were received, Mr. F. J. W. Holwill (upon taking up an appointment in London) and Dr. I. S. Loupekine (upon taking up an appointment in Nairobi).

R. J. G. SAVAGE, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION

1956

"THE WREN THE WREN
THE KING OF ALL BIRDS..."

JUDGING by the steadily increasing number of names on the sectional roll, the high average attendance figures for the indoor meetings, and the results being obtained with the co-operative field-work, the Section is enjoying the most successful period in its history. Nevertheless, it is a matter of concern that the organised field-work, which is surely the most important activity of any ornithological body, is not receiving the support of many members. This is made abundantly clear by the fact that only 164 nest record cards were returned—less than 1 card per member. It is to be hoped that this is only a temporary state of affairs and that by the time this report is published many more members will have been actively engaged in this part of the Section's work.

There were 27 additions to the sectional roll during the year and taking resignations into account the membership rose from 158 to 179.

At the Annual Business Meeting held on Wednesday, January 18, the Officers of the Section, Mr. H. H. Davis, Mr. P. J. Chadwick and Mr. G. E. Clothier, were unanimously re-elected as President, Hon. Secretary and Assistant Hon. Secretary ; Miss F. Wareham, Mr. B. K. Brooke and Mr. H. W. Neal were elected to serve on the General Committee, and the members of the Editorial Committee, Messrs. B. King, R. H. Poulding and M. A. Wright were unanimously re-elected.

During the year 9 indoor meetings were held at which the average attendance was 108 : these meetings are listed below :—

Jan. 18 : Annual Business Meeting : Messrs. D. M. and R. S. Cormack—Sea Birds of Ailsa Craig.
Feb. 8 : Summer Field-Programme Meeting : Mr. J. Vallis—colour slides of gull ringing on Steep Holm.
Feb. 25 : Mr. J. Fisher—Wild America.
Mar. 2 : Dr. N. W. Moore—Buzzards and Myxomatosis.
Mar. 21 : Dr. G. V. T. Mathews—Navigation in the Manx Shearwater.
Sept. 26 : Mr. H. F. I. Elliot—Tristan da Cunha.
Oct. 19 : Dr. C. J. F. Coombs—' Sierra de Gredos ', and ' Hooded Crows '.
Nov. 14 : Dr. B. Campbell—A Study of the Pied Flycatcher.
Dec. 3 : Informal Meeting.

In addition to these indoor meetings an all-day field meeting was held at Blagdon reservoir on Sunday, January 29 ; and two all-day coach excursions were made, the first on May 27 to the Forest of Dean, and the second on September 23 to Portland Bill Bird Observatory.

Five Evening field-walks were also arranged :—

May 4 : Portbury Wharf : Messrs. G. Bright and H. H. Davis.
May 8 : Aust Cliff to Littleton : Messrs. P. J. Chadwick and H. W. Neal.
May 14 : Lower Almondsbury to Cattybrook : Miss E. Lippiat, Mr. R. C. Hulbert.
May 23 : Brockley Coombe and Wood : Messrs. G. E. Clothier and M. A. Wright.
June 8 : Long Ashton to the Mile 3 Roadhouse : Col. G. A. Bridge, Mr. A. C. Leach.

The average attendance at these all-day excursions and evening field walks was 23.

A programme of co-operative field-work was arranged at the meeting on February 8, but was not completed due to a subsequent lack of helpers. The programme consisted of a census of rookeries in a selected area of South Gloucestershire, the continuation, for the 4th year, of the Wood Warbler distribution enquiry, and participation in the British Trust for Ornithology's Buzzard survey and nest record scheme.

Field-work not organised by the section but in which many of its members took part included wildfowl counting, the B.T.O. Heron census, and a census of the breeding gull population on Steep Holm organised by the Steep Holm Trust Gull Research Station. The other important non-sectional work carried out by some of its members was the ringing of 2,586 birds among which were Gannets, Buzzards, Merlins, Gulls, Wood Warblers and Pied Flycatchers.

The publication of the 7th issue of the Field-work Report was regretably delayed until the November meeting, but it is hoped that the 1956 Report will be on sale at the September meeting this year. These Reports cover the co-operative field-work, and the results of the ringing scheme, and also contain a section of original field-notes made by members.

(A number of back copies are available : prices 1 /–, 1950 ; 1 /3 1952, 53 ; 1 /6 1954, 55, postage extra.)

P. J. CHADWICK, *Hon. Secretary.*

THE JUNIOR SECTION

THE formation of the Junior Section, approved by Council at its meeting on October 27th, 1955, and noted briefly in last year's PROCEEDINGS, originated in an independent Club formed a year previously by a group of members of the Society who felt strongly that a move should be made to cater for the interests of young people. This experiment proved to be of great promise, a competent and responsible nucleus for a possible Junior Section of the Society was ensured, and it was with complete confidence that it was proposed to Council that such a Section should be formed.

The Junior Section now have their own committee elected from among their senior members : they plan and conduct their own meetings. Working with them for their guidance in Society matters and procedure the Committee of the original club continue in an advisory capacity. Its members are at present as follows :—Mr. Harry Savory (Chairman), Mrs. R. Millard (Hon. Secretary), Miss A. Bennett, Miss M. Jago, Mrs. P. Morris and Messrs. R. V. Culverwell, I. Evans, B. King and H. Neal. Our warm thanks are due to Dr. F. S. Wallis (Director of the City Museum), for his interest and for the facilities he has afforded us ; to Miss Bennett too, the Schools' organiser, who has given us the benefit of her experience and valuable assistance on numerous occasions.

At the time of going to press the number of members on the Junior Section Roll stands at 87 ; each is an associate member of the Society.

Interest and help by Society members and participation by many in the Section's meetings and expeditions have given much encouragement, conversely, the Advisory Committee are happy to think that no embarrassment has occurred in the activities of other sections. It is not too much to hope that in course of time some of the present members of the Junior Section will have valuable contributions to make in the service of the Society.

HARRY SAVORY, *Chairman, Advisory Committee.*

FIRST REPORT OF THE JUNIOR SECTION

1956

1955

Nov. 23 : Mr. Eric Hobbis. An illustrated lecture " Colour in the Garden ".

1956

Jan. 26 : Rev. Austen Williams, Rev. Martin Willson and Mr. Tony Soper. "An Account of Bird Photography and Sound Recording."

Mar. 1 : Mr. Cecil Bell talked on " Catching and Collecting Butterflies and Moths ".

Mar. 20 : Mr. Stenhouse Ross exhibited various fossils and explained their relationship to modern forms.

Apr. 10 : The first Business Meeting of the Section. A Member's Committee was formed and the following officers were elected :—Michael Edgell, Chairman ; Anita Drummond, Hon. Secretary. Miss A. Bennett gave a talk entitled " Is Collecting Specimens in the Field Really Necessary ? " Hans Seilman's film of the Woodpecker was shown.

Sept. 28 : Mr. E. L. Kelting, Chief Engineer of the Somerset River Board gave a talk on " Rambling on the River Banks and Sea Walls in Somerset ".

Oct. 20 : Major Maxwell Knight gave an illustrated lecture on " The Value and Fascination of Nature Study ".

Nov. 30 : Mr. Harry Savory on " Bird Life in Holland ".

FIELD MEETINGS, 1956

Apr. 4 : Brockley Coombe and Barrow Tanks. M. Edgell and S. Taff
Apr. 28 : Tickenham Hill to Portishead. Mr. and Mrs. D. Cullen
May 6 : Churchill Gate to Blagdon. A. Drummond
May 22 : Leigh Woods. Mr. H. Neal
June 16 : Abbots Leigh and Marsham Brook. Miss E. J. Vinnicombe
June 30 : Avon Gorge. Mr. Stenhouse Ross
July 21 : Steep Holm. Mrs. R. Millard
Aug. 10 : Blagdon Reservoir. N. Webb
Sept. 4, 5 and 6 : Steep Holm. Mr. H. Savory
Sept. 8 : Severn Beach. Messrs. B. King and R. Culverwell
Oct. 14 : Steart. Mr. B. King and Miss Irene Palmer (Somerset Naturalists)
Dec. 29 : Slimbridge. Mr. B. King

E. R. MILLARD, *Hon. Secretary,*
Advisory Committee.
A. DRUMMOND, *Hon. Secretary,*
Members Committee.

ACCOUNT OF THE GENERAL MEETINGS

1956

THE 93rd Annual General Meeting was held on January 26 when, with 135 members in attendance, the Officers and Members of Council for 1956 were duly elected.

The subject of the Presidential Lecture by the retiring President, Mr. Harry Savory, was " The Island of Steep Holm ". He spoke from long personal experience of the island and dealt with its many aspects including its history up to the present day. Much had been done to achieve the objects of the Steep Holm Trust which included the preservation of its historic features and wild life as well as the fostering of research. Mr. Savory's talk was illustrated with numerous slides and members were also shown a film on Flat Holm when flood-lights, which had been installed there for bird-protection, were formally accepted by Trinity House.

The newly-elected President, Mr. R. R. Bassindale, after being invested with the badge of office, drew the attention of the Meeting to all that the retiring President had done in the interests of the Society and of Natural History over many years.

In February, Mr. E. G. Neale gave an interesting lecture on " Badgers " which he illustrated by a most revealing film showing the life, feeding habits and patterns of play of these animals which he had conditioned to strong artificial light for the purposes of photography.

The Guest Speaker at the Annual Dinner in March was Professor Macgregor Skene who spoke on Photosynthesis under the title of " The Development of an Idea ".

In October, Dr. R. J. G. Savage described some of his experiences in Africa in a lecture on " A Naturalist in East Africa " and showed a series of unusually interesting colour transparencies. Many aspects of wild life were covered over an area which included the Kavirondo Gulf of Lake Victoria and the Great Rift Valley.

Professor H. R. Hewer was the speaker at the November meeting when members heard his lecture on " The Grey Seal " and saw many descriptive slides, as well as a colour-film taken on Shillay, west of the Outer Hebrides. This film showing the habits and breeding grounds of the Grey Seal impressed members with the progress which Professor Hewer had made in the scientific study of its life.

At the December meeting, Mr. F. T. K. Pentelow, Chief Inspector of Salmon and Freshwater Fisheries, gave an illustrated lecture on " Salmon and Trout " which greatly appealed to members of all Sections who were present.

C. S. CARLILE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

THE 1956 season was notable for three new ventures : The first all-night meeting, the first general field meeting in Wales, and the first visit to Gilbert White's home at Selborne. In order to economise space only a brief summary of these meetings is given here, but a much fuller account has been written and is kept in the records of the Field Section.

April 21st : Leaders, Messrs. E. P. Bury and H. Webb. Westridge Woods, followed by a visit to Charfield to see the wild tulip, and to Tortworth to see the ancient Spanish chestnut.

May 19th: Leaders, Mr. and Mrs. R. F. Wills and Mr. H. W. Neal. An all-night meeting to Dunkery Beacon to hear the dawn chorus.

May 26th: Leaders, Messrs. A. W. Adam and A. F. Devonshire. The Black Mountains in Brecon, including Partrishow, Grwyne Faur Valley, and Llargorse Lake.

June 10th: Leaders, Mr. H. Savory and Miss M. Jago. Selborne and the home of Gilbert White.

June 23rd: Leaders, Messrs. I. H. Payne and P. J. Room. Asham Wood and Edford Wood near Frome.

July 14th: Leaders, Mrs. G. D. Wakefield and Mr. I. Evans. A joint meeting with the North Somerset Natural History Society. Compton Dundon Hill, and Butleigh Moor near Glastonbury.

Aug. 18th: Leaders, Mr. and Mrs. R. F. Wills. Painswick Beacon via Westonbirt and Tetbury, returning via Cranham Woods and Wotton-under-Edge.

Sept. 8th: Leaders, Mr. and Mrs. D. A. C. Cullen. Chew Valley Lake and the old lead workings at Charterhouse-on-Mendip.

A. F. DEVONSHIRE, *Hon. Secretary.*

BRISTOL BOTANY IN 1956

By Cecil I. and N. Y. Sandwith

THE year 1956 was remarkable for an unusually dry and cold spring, followed by a pitifully wet summer with only one very short spell of hot sunny weather near the end of July. Persistent cold winds and drought began in February and the winds continued well into June, but May was a beautiful sunny month and the flowering trees were in splendid form, benefiting no doubt from the warm summer of the previous year. The ground vegetation was extraordinarily backward. On the Somerset peat moor by the first week of June there was scarcely a flower to be seen in the Sharpham Reserve, and none of the sedges seemed to be producing any spikes. Later on, in September, in spite of the rain, conditions of drought were still evident on the moors and the rhines were easy to walk over. October and November were dry months. There were very heavy crops of apples, and our medlar tree at Tickenham has never borne so well, although the fruits ripened later than usual.

We have received an unusually large number of records from many contributors, which is very gratifying, and we hope that in future they will all send in their notes not later than the middle of December. The Distribution Maps Scheme of the Botanical Society of the British Isles has undoubtedly aroused great interest in our area as elsewhere, and is responsible for some interesting and genuine discoveries, as well as for a number of doubtful entries which have had to be challenged. Workers for the Scheme are strongly advised to keep voucher specimens of any plant of whose name they are not quite sure.

Among the new contributors we have received through the Scheme we welcome especially Mr. P. F. Hunt, who is investigating the flora of the neighbourhood of Frome. The south-eastern corner of our district presents an interesting variety of soils and landscape, with a correspondingly rich flora which has been little worked in recent years, although it was well explored by Dr. H. F. Parsons near the end of the last century and was frequently visited by Mr. White and his friends. At this stage it seems well to fix the boundary of White's "Bristol District" in this region by the main road (A36) leaving Limpley Stoke village and proceeding to Woolverton and Beckington, and from here by the road (A 361) leading from Beckington to Frome, Holwell, along the south border of Asham Wood, and so to Doulting and Shepton Mallet.

Mr. G. W. Garlick continues to send many useful records, especially of critical plants, from the Gloucestershire side of the district, as well as from the Avon Gorge where he has been specialising in bryophytes. As usual, we use his initials, G.W.G., in the following notes.

The untimely death, in an accident, of Miss Edith Rawlins has taken from us a valued correspondent who explored very thoroughly the Mendip country around Shipham, Winscombe and Axbridge.

Thalictrum flavum L. Ditch by roadside, Hinton, **G.**, *Dr. D. Munro Smith.*

Berberis vulgaris L. On oolite at Laverton, **S.**, *P. F. Hunt.*

Papaver Argemone L. In garden ground at Nettlebridge, **S.**, *F. M. Pilkington.*

Meconopsis cambrica L. One plant in the lane leading to Flax Bourton Combe, **S.**, *C. H. Cummins.* Two plants on the river-bank at Vallis, **S.**, *P. F. Hunt.* Certainly introduced in both stations.

Saponaria officinalis L. Berkeley Road Station, **G.**, *G.W.G.*

Stellaria Holostea L. var. *laciniata* Bromf. Specimens coming under this variety were gathered in a hedge near Publow, **S.**, by *Mrs. W. Cummins.* A first record for the district.

Malachium aquaticum (L.) Fr. A plant with the deformed petals and anthers attacked by the chocolate-coloured smut, *Ustilago violacea* (Pers.) Fuckel, was found by us last September on the peat moor near Ashcott Station, **S.** *Dr. R. W. G. Dennis* tells us that this is an unusual host for this smut, which is so well known on the flowers of the Campions and *Stellaria graminea.*

Minuartia tenuifolia (L.) Hiern. Side of old colliery railway, Froglane Pit, Coalpit Heath, **G.**, *Dr. D. Munro Smith.*

Hypericum Androsaemum L. Bushy Grove, Berkeley, **G.**, *G.W.G.*

H. dubium Leers. Chipping Sodbury Railway Station, **G.**, *G.W.G.* Asham Wood, **S.**, *G. C. Druce.* Dr. Druce's specimen was originally determined by the late *Dr. E. Drabble* as *H. Desetangsii* Lamotte var. *imperforatum* Bonnet, the record being published in *B.E.C.* 1930 Rep. vol. ix. p. 338. It has recently been re-examined in Herb. Druce (now in the Oxford University Herbarium) by *Dr. N. Robson,* who identifies it as *H. maculatum* Cr. subsp. *obtusiusculum* (Tourlet) Hayek ; in other words, as *H. dubium* Leers., which is also recorded from Asham Wood by *P. F. Hunt.*

Geranium Robertianum L. subsp. *maritimum* (Bab.) H. G. Baker. This maritime plant, with a distinctive habit and usually with glabrous carpels, is newly defined by Dr. Baker in *Watsonia*, vol. 3, pp. 272-276 (1956). He cites herbarium specimens from between Worle and Kewstoke, 1907, *E. S. Marshall*, and several gatherings from Steep Holm, **S**.

Impatiens capensis Meerb. Oldford and Beckington, **S**., *P. F. Hunt.*

I. glandulifera Royle. Bushy Grove, Berkeley, **G**, *G.W.G.* Holcombe, **S**., *P. F. Hunt.*

Coronilla varia L. Railway embankment, Charfield Station, **G**., *G.W.G.*

Lathyrus sylvestris L. Lane between Lullington and Laverton Scrub, **S**., *P. F. Hunt.*

Rubus Idæus L. A curious sport with numerous bracts on the pedicels, increasing in size and number under the calyces, has been found at Tedbury Camp, near Frome, **S**., by *Miss E. Overend*, and appears to be constant. Similar examples of phyllody in the inflorescences of raspberry bushes are reported in *Journ. Bot.* 19, p. 31 (1881), *B.E.C.* 1919 Rep. p. 814 and (less similar) 1927 Rep. p. 570. Ripe fruits are produced on the Tedbury Camp bushes.

R. laciniatus (Weston) Willd. Rodway Hill, Mangotsfield, **G**., *G.W.G.*

Sorbus eminens E. F. Warburg. First reported from the Somerset side of the Avon Gorge several years ago by *Dr. S. M. Walters*, and noted there again last year by *G.W.G.*, whose specimens were confirmed by *Dr. E. F. Warburg.*

S. porrigentiformis E. F. Warburg. A few small bushes near the "Great Fault", Clifton Down, **G**., *P. J. M. Nethercott.* On the Leigh Woods slope of the Avon Gorge, **S**., *G.W.G.* Specimens from both localities were passed by Dr. Warburg.

S. anglica Hedl. In two spots on the Leigh Woods slope of the Avon Gorge, **S**., *P. J. M. Nethercott*, confirmed by Dr. Warburg. With the addition of this and the preceding species the *Sorbus* flora of the Avon Gorge becomes richer than that of Cheddar. Callow Rocks, Sidcot, **S**., *Dr. A. J. Willis.*

Myriophyllum spicatum L. Pond, Frogland Cross, **G**., *G.W.G.*

Callitriche platycarpa Kütz. The plant in the mill-pond at Cheddar, **S**., recorded in *White, Flora*, p. 528, as *C. palustris* L., is to be referred here on the evidence of specimens collected there in 1918 by *Miss E. S. Todd* (see *B.E.C.* 1918 Rep. p. 380, as *C. palustris*) and in 1936 by *N.Y.S.* Both gatherings have been determined as *C. platycarpa* by *Mr. J. P. Savidge.* True *C. palustris* L., with tiny obovoid fruits, is not yet known to occur in Britain.

Epilobium parviflorum Schreb. × *roseum* Schreb. St. Catherine's Court, Bath, **S.**, 1954, *G.W.G.*

E. obscurum Schreb. × *parviflorum* Schreb. Spar Pools, Yate, **G.**, 1955, *G.W.G.*

E. adenocaulon Hausskn. Quarry, Middlemill, Stone, **G.**, *G.W.G.*

E. adenocaulon Hausskn. × *montanum* L. Northmead Lane, Iron Acton; and Splatts Wood, Kilcot, **G.**, *G.W.G.* Mr. Garlick's *Epilobia* have all been verified by *Mr. G. M. Ash.*

Œnanthe Lachenalii C. C. Gmel. Sheperdine, **G.**, *G.W.G.*

Torilis arvensis (Huds.) Link. Waste ground, Downend; and cornfield, Marshfield, **G.**, *Dr. D. Munro Smith.*

Viburnum Tinus L. Established on the Leigh Woods slope of the Avon Gorge, **S.**, *P. J. M. Nethercott.*

Sambucus Ebulus L. In a hedge near Puxton Church, **S.**, *Miss E. Rawlins.*

Asperula cynanchica L. Barrow Hill and Laverton, N. of Frome, **S.**, *P. F. Hunt.*

Valerianella carinata Lois. Winterbourne Railway Station, **G.**, *G.W.G.*

Dipsacus pilosus L. Whitewell Bottom, Kilcot, **G.**, *G.W.G.*

Linosyris vulgaris DC. *Mrs. B. Welch* informs us that the British Museum Herbarium possesses a very old specimen, duly localized, from the locality where Dr. Druce first reported this rare species in 1904. This specimen, formerly in the herbarium of Sir Joseph Banks, was collected by *Dr. Wollaston* in 1813 and is the earliest evidence for the occurrence of *L. vulgaris* in Somerset.

Achillea Millefolium L. var. *lanata* Koch. Sea-wall between Brean Down and Uphill Ferry, **S.**, *C.I.S.* A small habitat form, densely greyish-woolly all over.

Senecio squalidus L. The earliest local record is "Bristol, 1843", **G.**, *Bromfield* in Herb. Kew, see *D. H. Kent* in *Proc. Bot. Soc. Brit. Is.*, vol. 2, pp. 116–117 (1956). Roadside south of Battlebury Road, south of Wookey, **S.**, *K. A. Franey.*

S. viscosus L. By the railway and on waste ground at Vallis, **S.**, *P. F. Hunt.*

Cirsium eriophorum (L.) Scop. Disused railway, Timsbury, **S.**, 1948, *E. S. Smith*, fide *F. Perring.*

Tragopogon porrifolius L. Over a dozen plants on the slope of a cliff on Brean Down, **S.**, *I. W. Evans.*

Hieracium eboracense Pugsl. (*H. tridentatum* Fr. of *White, Fl.*). Top of Breakheart Hill, Dursley, **G.**, *G.W.G.*, det. *P. D. Sell* and *C. West.*

H. salticola (Sudre) Sell et C. West. Railway embankment, Westerleigh, **G.**, *G.W.G.*, det. *Sell* and *West.*

Campanula latifolia L. Three plants by the river in Glen Frome, Hambrook, **G.**, *Dr. D. Munro Smith.* Apparently not previously recorded farther upstream than Frenchay. In several spots in woodland at Vallis Vale, **S.**, *P. F. Hunt* and *Miss E. Overend.* This record, supported by specimens, is the first certain evidence for the occurrence of this plant on the Somerset side of the district. There are, however, several introduced species in the woods near Mells, and the status here of *C. latifolia* is open to question.

Vaccinium Myrtillus L. Woodhouse Down, Almondsbury, **G.**, introduced from Wales into a garden some 15 years ago and escaping over a very small area in the vicinity, *M. Ewing*, fide *K. M. Brown.*

Lysimachia Nummularia L. Specimens with mature capsules and seeds were collected by us last September on the peat moor near Ashcott Station, **S.**

Anagallis arvensis L. var. *carnea* Schrank. Cornfield north of Hook Row, Berkeley, **G.**, *G.W.G.* Cultivated field, Cheddar, **S.**, 1918–1920, *N.Y.S.* Sidcot, **S.**, 1877, *W. B. Waterfall*, in Herb. Kew.

Hottonia palustris L. Sparingly in ditches at Puxton, **S.**, *Miss E. Rawlins.*

Buddleja Davidii Franch. Abundant in quarries on the Leigh Woods side of the Avon Gorge, **S.**, *P. J. M. Nethercott*, who reports that this plant is disappearing from many bombed sites in Bristol which have been rebuilt.

Gentianella anglica (Pugsl.) E. F. Warburg. Battlefields, Lansdown, **S.**, June 1955, *Miss F. M. Barton*, det. *N. M. Pritchard.* Our second station for this species (see "Bristol Botany in 1944").

Symphytum tuberosum L. Hardington Wood, N.W. of Frome, **S.**, *P. F. Hunt.*

Atropa Belladonna L. A single plant among brambles in waste land between Nettlebridge and Ashwick, **S.**, *F. M. Pilkington.*

Linaria repens (L.) Mill. At Mells colliery, **S.**, *P. F. Hunt.*

Euphrasia nemorosa (Pers.) H. Mart. var. *transiens* Pugsl. On oolite near Laverton, **S.**, *P. F. Hunt*, det. *E. F. Warburg*

E. anglica Pugsl. × *brevipila* Burnat et Gremli. On the peat moor at Sharpham Reserve and Street Heath, **S.**, see *P. F. Yeo* in *Watsonia*, vol. 3, p. 263 (1956).

Mentha longifolia (L.) Huds. Waste ground, Warmley, **G.**, *Dr. D. Munro Smith.*

M. × *piperita* L. var. *piperita.* By a ditch N.E. of Flax Bourton Church, **S.**, *Dr. A. F. Devonshire.*

M. × *Smithiana* R. Graham (*M. rubra* Sm. of *White, Fl.*). Flax Bourton Combe, **S.**, *id.* All these Mints were verified by *Mr. R. A. Graham.*

Atriplex littoralis L. At Brean, by farm buildings below the Down, **S.**, *C.I.S.* and *N.Y.S.* It was recorded from the beach south of Brean by *Commander R. D. Graham*, in *Rep. Bot. Sect., Som. Arch. and Nat. Hist. Soc.* for 1946.

Salicornia dolichostachya Moss. Tidal mud-flat, Portishead, **S.**, *P. F. O'Neill.* A fresh specimen was named at Kew.

Daphne Laureola L. Wood at Camerton, **S.**, P. F. Hunt. Vallis, **S.**, *H. F. Parsons*, in *Fl. Som.*

Euphorbia virgata W. et K. Cornfield near Marshfield, **G.**, *Dr. D. Munro Smith*, det. *G.W.G.*

Mercurialis annua L. The monoecious " variety " *ambigua* (L.f.) Duby occurred in garden ground at Tickenham, **S.**, *C.I.S.*

Betula pubescens Ehrh. Michael Wood, Charfield ; and Bushy Grove, Berkeley, **G.**, *G.W.G.* Quarries and plateau, Leigh Woods, **S.**, *G.W.G.*

Quercus petraea (Mattuschka) Liebl. Dodington Park, **G.**, *G.W.G.*

Salix Caprea L. × *viminalis* L. Bury Hill, Moorend ; and lane between Latteridge and Itchington, **G.**, *G.W.G.*, det. *R. D. Meikle.*

Populus tremula L. One tree in a hedge below Axbridge, and another between Callow and Hale, **S.**, *Miss E. Rawlins.*

Elodea callitrichoides (Rich.) Caspary. In the Kennet and Avon Canal at the Dundas Aqueduct, **S.**, *J. P. M. Brenan.* New to the district. A native of Temperate South America, previously recorded from Herts. and Middlesex and believed to be accidentally introduced by owners of aquaria, see *Proc. Bot. Soc. Brit. Is.*, vol. 1, pp. 321–322 (1955). In this locality it extends into S. Wilts.

Epipactis Helleborine (L.) Cr. A single plant on a wooded slope of Durdham Down, Clifton, **G.**, *P. J. M. Nethercott.* A very interesting find, since this orchid had not been reported from the Glos. side of the Gorge since 1799 (see *White, Fl.*, p. 567).

Orchis ericetorum (Linton) Marshall × *Fuchsii* Druce. Lower Woods, east of Wickwar, **G.**, 1954–1956, *G.W.G.*, det. *V. S. Summerhayes.*

Ophrys muscifera Huds. In scrub on oolite at Laverton, **S.**, *P. F. Hunt.*

Herminium Monorchis L. *Mr. J. D. Grose*, author of the forthcoming new Flora of Wiltshire, has kindly drawn our attention to a very curious error on p. 455 of *Fl. Glos.*, where the Musk Orchid is recorded from " Colston Hill, Bristol, 1724, *Dillenius* ", this record being claimed as the first for v.c. 34. As Mr. Grose points out, reference to Druce and Vines's book, " The Dillenian Herbaria ", shows that one of the editors of *Fl. Glos.* not only has altered Dillenius's spelling of the name of the Hill but also, with no justification, has added "Bristol". Dillenius's locality, in fact, was Coulston Hill, in Wiltshire (cf. Druce and Vines, loc. cit., pp. 114 and 144).

Iris foetidissima L. Asham Wood, **S.**, *P. F. Hunt.*

Narcissus Pseudonarcissus L. Common in Asham Wood, **S.**, *id.*

Juncus Kochii Schultz. Michael Wood, Charfield, **G.**, *G.W.G.* Shapwick Heath, **S.**, *P. C. Hall.*

Sparganium simplex Huds. By the River Frome at Lullington, **S.**, *H. F. Parsons* in *Fl. Som.*, and P. F. Hunt.

Lemna gibba L. The tideline along the sands from Berrow saltmarsh to the pier at Burnham, **S.**, was made up almost entirely of this species, *G.W.G.*

Zannichellia palustris L. var. *palustris*. Pond, Dodington Park, **G.**, *Mrs. W. Cummins.*

Eleocharis uniglumis (Link) Schult. Marsh below Yate Rocks, **G.**, *G.W.G.* An excellent addition to the Glos. side of the district, and a first record for v.c. 34.

Eriophorum angustifolium Honck. Weston-in-Gordano moor, **S.**, Sept., 1920, *N.Y.S.*, and still there last summer.

E. vaginatum L. A single tuft in an enclosure on Weston-in-Gordano moor, **S.**, *C.I.S.* and *N.Y.S.* A remarkable survival (from former peat bog vegetation ?) which had hitherto escaped notice, although we ourselves had often been in this enclosure in former years.

Carex elata All. (*C. Hudsonii* Ar. Benn.). The site reported for this species on Weston-in-Gordano moor, **S.**, in " Bristol Botany in 1936 ", has been destroyed by raising and levelling of the ground, but a tuft fortunately survives in a marshy enclosure not far distant, *C.I.S.* and *N.Y.S.*

C. disticha Huds. Still in the dune-marsh at Berrow, **S.**, *Dr. A. J. Willis.*

Calamagrostis Epigejos (L.) Roth. In scrub on oolite at Laverton, **S.**, *P. F. Hunt.*

Deschampsia flexuosa (L.) Trin. Peat moor north-west of Shapwick Station towards Westhay Heath, **S.**, *P. C. Hall.* Apparently the first record from the peat moors. We have not seen a specimen.

Sieglingia decumbens (L.) Bernh. There seems to be no published record from the peat moors, **S.**, but the species has been noted there, especially in dry grassy spots, by several observers.

Molinia caerulea (L.) Moench. Sparingly in a green lane at Rangeworthy, **G.**, *G.W.G.*

Poa angustifolia L. Winterbourne Railway Station, wall-top at Itchington, and by the railway at Iron Acton and bordering Yate Common, **G.**, *G.W.G.*

Glyceria × *pedicellata* Towns. Ditch at Middlemill, Stone, **G.**, *G.W.G.*

Bromus Thominii Hard. Tow-path under Leigh Woods, **S.**, *G.W.G.* Shepton Mallet, and near Shapwick Station, **S.**, 1944, *J. P. M. Brenan*, whose records, previously unpublished, were the first for the district. All these gatherings were seen by *Mr. C. E. Hubbard.*

B. lepidus Holmb. Waste ground by the New Cut, Bristol, **G.**, *C.I.S.* and *N.Y.S.* Pasture west of Northwoods, Winterbourne, **G.**, *G.W.G.*

Azolla filiculoides Lam. Highbridge, **S.**, *Mrs. Perrett*, see *Rep. Bot. Sect., Som. Arch. and Nat. Hist. Soc.* for 1953.

ALIENS. *Roemeria hybrida* (L.) DC. Fowl-run, Nempnett, **S.**, *Mrs. Arnold*, comm. *I. W. Evans.*

Sisymbrium altissimum L. Lyde Green, **G.**, *Dr. D. Munro Smith.*

Vicia narbonensis L. var. *serratifolia* (Jacq.) Sér. and *V. benghalensis* L. were found on waste ground at Mangotsfield, **G.**, by *Dr. D. Munro Smith.*

Helianthus petiolaris Nutt. was collected at Avonmouth Dock, **G.**, by ourselves and other botanists. We saw and heard of nothing else worth recording at Avonmouth.

Datura Stramonium L. Tip at Fishponds, **G.**, *Dr. D. Munro Smith.* Stoke Bishop, **G.**, *Mrs. Borwell Turner*, comm. *P. F. Bird.*

Melampyrum arvense L. In an orchard at Redfield Hill, near Oldland Common, **G.**, *Miss P. M. Cooke*, comm. *P. F. Bird.* The first record for the district of this species, which the finder suggests may have arisen from grain scattered for hens in the orchard last winter.

Muscari comosum (L.) Mill. A single plant in rough pasture (the station of *Lotus siliquosus*) near Marshfield, **G.**, *Dr. D. Munro Smith*, det. *P. F. Bird.*

Avena strigosa Schreb. With *Phalaris canariensis*, etc., on a road verge at Bury Hill, Yate Rocks, **G.**, *G.W.G.*

Lolium × *hybridum* Hausskn. (*L. multiflorum* Lam. × *perenne* L.). Bombed site, Redcliffe, Bristol, **G.**, *C.I.S.*

BRISTOL BIRD REPORT
1956

Compiled by the Editorial Committee of the
B.N.S. Ornithological Section

P. J. Chadwick B. King
H. H. Davis R. H. Poulding
M. A. Wright

ACKNOWLEDGMENT is due to those who have forwarded their observations for 1956 and who have thereby helped to maintain the continuity of this annual report. To publish the whole of such observations is not possible but, as previously, the compilers have endeavoured to include all which may be considered important. Unpublished notes will, of course, be preserved and will serve as a valuable source of reference for the compilation of subsequent reports, for any revision of the local bird list, and in connection with future field enquiries. Members are particularly asked to assist in the preservation of their notes by applying for, and using, the 6″ × 4″ record cards.

Observations of special note from the reservoirs include those of a Hen Harrier at Chew Valley in February ; a Red-necked Grebe at the same place in March ; a Little Ringed Plover at Blagdon in April ; a Little Gull and Wood Sandpipers at Chew Valley, August-September ; a Sandwich Tern and a party of ten Curlew Sandpipers at Chew Valley in September ; Grey Plover in the same month at Cheddar ; and Spotted Redshanks at Blagdon, Cheddar and Chew Valley on various occasions, August to early November. A wintering Spotted Redshank was seen at Chew Valley in January-February and another, and a Ruff, were reported from Blagdon in December.

Among duck census returns particular mention may be made of a combined count at Blagdon, Chew Valley and Cheddar on January 8th resulting in a record total of more than 7,100 birds—Teal numbering 2,900 ; Wigeon, 1,700 and Pochard, 930. During severe and prolonged frost in February unprecedented numbers of Wigeon (peak 2,360) and White-fronted Geese (up to 350) were reported from Chew Valley, while observations at Blagdon and Chew Valley on the 26th suggested that not less than 100 Bewick's Swans—birds probably frozen out from Holland—were in the area. This influx of Bewick's was, doubtless, part of a much larger invasion reported from the Ouse Washes in Cambridgeshire, where, on February 26th also, a peak total of more than 670 was recorded. Further noteworthy visitors to the reservoirs were Red-breasted Mergansers at Chew Valley and Cheddar, February-March ; a Whooper Swan at Blagdon, February-April ; and Common Scoters (party of eight) at Cheddar in September.

From a New Year total of 1,400, White-fronted Geese at the New Grounds had increased to a record figure (*c.* 5,000) by the last week of February and by mid-March a Greylag, two Greenland White-fronts, six or more Lesser White-fronts, two Bean Geese, a few Pink-feet and a Barnacle had been identified among them. Pink-footed Geese in autumn reached a maximum total of 65 in mid-November. Tufted Duck (up to 87), Pochard, Goldeneye, Smew and Whooper Swan—uncommon visitors to the Estuary—were reported from the New Grounds between early February and the end of April. An unexpected event was the occurrence of an adult male Blue-winged Teal which, in company with Shovelers, flew in at the Wildfowl Trust enclosures in the fourth week of December.

Other important records are of Velvet Scoters near Clevedon in February ; an Eider at Steep Holm in May ; Hoopoes at Whitchurch in May and at Ashley Down, Clifton and Syston in July-August ; Wood Sandpipers at Woodspring in September ; a Wryneck in the same month at Tortworth ; a Lapland Bunting at Wotton-under-Edge in October ; and a Long-tailed Duck at Weston-super-Mare in November. Breeding records of special note are of the successful rearing of Buzzards at an eyrie near Berkeley ; the breeding of over 30 pairs of Tufted Duck at Chew Valley reservoir ; the continued breeding of Shelduck and Lesser Black-backed Gulls at the same reservoir ; and an increase to more than 70 pairs of Great Black-backs on Steep Holm.

Interesting ringing recoveries include those of Herring Gulls ringed on Steep Holm and recovered in such scattered areas as Shropshire, Yorkshire and Co. Wexford ; a Song Thrush recovered where ringed at eight years old ; and a Chaffinch (presumably Continental form) ringed at Long Ashton and recovered eighteen months later in Sweden.

Unless otherwise stated the records below refer only to 1956, and for the most part are the result of contributions by the following *members* : R. Angles, S. H. G. Barnett, Miss B. M. Bigg, A. E. Billett, P. F. Bird, H. J. Boyd, G. Bright, B. K. Brooke, G. C. Buxton, Mrs. S. I. Buxton, P. J. Chadwick, Miss G. G. Clement, G. E. Clothier, A. B. Cook, D. M. Cormack, Miss D. Crampton, H. H. Davis, H. Dunnicliff, M. Edgell, Miss P. Farmer, C. H. Fry, V. H. Grandfield, Miss C. Groves, D. R. Hamblett, R. G.

Hamilton, W. A. Holmes, D. Howell, M. Howell, D. J. E. Johnson, B. King, H. R. H. Lance, A. C. Leach, J. A. Lewisohn, Miss M. E. Maunder, T. D. H. Merrie, Mrs. D. Milburne, Mrs. M. W. Milward, H. W. Neal, P. J. M. Nethercott, R. Pitman, R. H. Poulding, J. A. Pryce, W. L. Roseveare, J. H. Savory, P. Scott, T. B. Silcocks, F. A. Smith, S. M. Taylor, Mrs. S. M. Taylor, J. Vallis, M. Wagner, N. Webb, M. J. Welch, J. A. F. Wilkins and M. A. Wright. *Non-member contributors* are C. Baker, G. L. Boyle, E. G. Brain, J. Bush, E. H. Clogg, R. V. Collier, A. Cumber, M. Davy, A. G. Dixon, R. Eggleton, I. J. Ferguson-Lees, J. Gould, T. Hamlett, E. G. Holt, S. T. Johnstone, R. J. Lewis, Rev. J. R. Lowe, G. Madge, E. Martini, G. V. T. Mathews, G. R. Moore, J. A. McGeoch, Miss E. D. Overend, Mrs. R. Rees, B. W. Renyard, E. G. Richards, D. R. Saunders, C. M. Swaine, and H. Woffenden. Observations are followed by the appropriate initials throughout. The initials D.B.P.S. denote records supplied by the Dursley and District Bird-Watching and Preservation Society, and the abbreviation Res. Stn. refers to the Steep Holm Trust Gull Research Station.

The area covered is that part of Gloucestershire (**G**.) lying east of the Severn and south of a line from the New Grounds to the county boundary at Tetbury, and Somerset (**S**) north of the R. Axe and a line from Wells to the county boundary near Frome. For the purpose of this Report the area extends westward into the Channel and Estuary to include the promontory of Brean Down and the islands of Steep Holm and the Denny (cf. Sketch Map, *Proc. B.N.S.*, 1947, p. 225).

GREAT NORTHERN DIVER *Gavia immer*

S. Single birds, Chew Valley res., Jan. 10 (H.H.D., B.K., I.J.F.-L.) and Blagdon res., Dec. 29, 30 (R.A., R.P., M.A.W. *et al.*).

GREAT CRESTED GREBE *Podiceps cristatus*

S. Max. counts, Cheddar res., late Jan. to early Mar. (peak total, twenty-four, Feb 26) and mid-Oct. to late Dec. (B.K., J.A. McG.). Twelve pairs, Chew Valley res., Mar. 25 and four pairs with young, June-July (B.K.). Autumn counts, same place : 55, Aug. 12 (M.A.W.) and 49, including two small juveniles, Sept. 8 (P.J.C.). Two pairs, Blagdon res., June 8, but no sign of breeding—due perhaps to low water level and absence of suitable cover (W.L.R.).

RED-NECKED GREBE *Podiceps griseigena*

S. One in close company with Great Crested Grebes, Chew Valley res., Mar. 18 ; identified by G.L.B. who has forwarded full and conclusive details.

SLAVONIAN GREBE *Podiceps auritus*

S. One, Chew Valley res., Feb. 12-Mar. 11 (G.C.B., G.L.B., B.K., R.H.P.) and one, Cheddar res., Dec. 2 (W.A.H.), 6 (J.A.McG.).

LITTLE GREBE *Podiceps ruficollis*

G. Pair with three young, Eastville Park Lake, Bristol, May 23 (J.A.P.).

S. Two pairs with young, Chew Magna res., Aug. 11, when seventeen birds present in all (P.J.C.). Adults with four small young, Chew Valley res., Aug. 25 (B.K.). Winter records of 19, Barrow Gurney resrs., Jan. 4 (A.C.L.) and 25, Blagdon res., Feb. 5 (P.J.C.).

STORM PETREL *Hydrobates pelagicus*

S. One found in tide wrack, Sand Bay, Oct. 14, and correctly described (R.A.).

GANNET *Sula bassana*

S. Dead adult, Sand Bay, Dec. 23 (T.B.S.).

CORMORANT *Phalacrocorax carbo*

G. Party of twelve on Estuary, Purton, Feb. 26 ; two along canal, same place (one on telegraph pole), Sept. 23 (R.V.C.). One in flight over Avon Gorge, Sept. 29 (P.J.M.N.). Party of eight flying downstream, Aust Cliff, Oct. 21 (B.K.B., M.A.W.).

S. Seven to ten, Cheddar res., various dates, Feb. 12-Apr. 8 (J.A.McG., J.A.P.). Thirty nests, Steep Holm, May 6 (Res. Stn.).

HERON *Ardea cinerea*

S. Twenty-six occupied nests, Brockley Combe, Apr. 28 (B.K., J.A.P.) ; 22 occupied nests, Uphill Grange, May 7 (W.L.R.). No breeding reports from Orchardleigh Park, Frome, and Warleigh Wood, Bath. Seventeen birds, Chew Valley res., Aug. 12 and twenty-five, Sept. 8 (P.J.C., M.A.W.).

MALLARD *Anas platyrhynchos*

G. Max. counts on Estuary, New Grounds—620, Jan. 14, and 900, Sept. 16 (H.J.B.). Combined totals of 128, Eastville Park and Duchess' Pond, Stapleton (both within City boundary), Jan. 15, Feb. 13 (J.A.P.).

S. Coastal counts include : 116, Sand Bay, Feb. 12 (W.L.R.) and 186 off Brean Down, Nov. 11 (P.J.C., M.A.W.). Totals varying from 350–420, Blagdon res., Jan.–Feb. (B.K.B., R.P., *et al.*)

and from 265–385 in period Aug.–Dec. (G.C.B., S.I.B., M.A.W. *et al.*). Count of 500 (450 males), Chew Valley res., May 27 and exceptional summer total of 600, July 20 (B.K.) while from 500 to 590 reported, same place, various dates, Aug.–Oct. (G.C.B., P.J.C. *et al.*). Max. figures of 161, Barrow Gurney resrs., Feb. 12 (G.E.C.) and 163, Cheddar res., Sept. 1 (P.J.C.). Breeding records : 15–20 broods, Chew Valley (B.K.) and female with three week-old ducklings, same reservoir, as late as Dec. 2 (G.C.B., S.I.B.).

TEAL *Anas crecca*

G. Highest count from the Estuary, New Grounds—600, Dec. 29 (H.J.B.).

S. Remarkably high number of 2,500 or more, Blagdon res., in first fortnight of January, with record total of 2,900 on 8th (P.J.C., H.H.D., B.K.). Counts varying between 750 and 955, same reservoir, various dates, Nov.–Dec. (T.B.S., M.A.W. *et al.*). Max. total of 600, Chew Valley res., Sept. 22 (B.K.). The only noteworthy coastal count is of 145, Axe Estuary, Dec. 28 (W.L.R.).

GARGANEY *Anas querquedula*

S. Single male, Cheddar res., Mar. 31–Apr. 3 (B.K., J.A.McG. *et al.*). Pair, Blagdon res., Apr. 27, 29 (G.L.B., B.K.).

BLUE-WINGED TEAL *Anas discors*

G. An adult male, evidently a wild bird, visited the W.T. enclosures, Slimbridge, Dec. 24, and was first seen flying in from the Estuary with a party of four Shovelers (M.D.). Still present on successive days, being finally caught (29th) and feather-cut. Subsequent enquiries by S.T.J. have shown that no Blue-winged Teal had escaped from captivity and that the species is not being kept in any Continental collection. This record will be the subject of a note in a forthcoming issue of *British Birds.*

GADWALL *Anas strepera*

S. Up to six, Blagdon res., several dates, Feb. and up to seven on various occasions, Nov.–Dec. (B.K., J.A.P., J.V. *et al.*). Single male, Chew Valley res., Oct. 28 (P.J.C., R.P.). N.B.—Some of these may be descendants of a small population of semi-feral, hand-reared birds at the Wildfowl Trust (Glos.).

WIGEON *Anas penelope*

G. Largest totals on Estuary, New Grounds—*c.* 2,000, Jan. 12, 29—decreasing to 1,600, Feb. 13 ; *c.* 2,000, same place, Dec. 29 (H.J.B.).

S. Numbers reported at Chew Valley res., Jan.–Mar., exceeded any previously recorded for the County; peak totals of 2,360, Feb. 9, and 2,200 on 18th and 26th (B.K., R.H.P. *et al.*); 2,000, still present, same place, Mar. 11 (G.C.B. *et al.*). A pair, Chew Valley res., May 27, and two males and a female as late as third week of June (B.K.). Max. total, Blagdon res.,—455, Nov. 21 (G.C.B., S.I.B.).

PINTAIL *Anas acuta*

G. New Grounds: counts of 183, Jan 14; 166, Feb. 13; and 153, Dec. 8 (H.J.B.).

S. Present in small numbers at reservoirs with maxima of 15, Blagdon, Jan. 13 (B.K.) and 13, Nov. 7 (G.C.B., S.I.B.); 12, Chew Valley, Feb. 5 (D.C. *et al.*) and 38 (26 males), Dec. 16 (B.K.).

SHOVELER *Spatula clypeata*

G. The only noteworthy report is of 42 on Estuary, New Grounds, Jan. 14 (H.J.B.).

S. Max. counts: Cheddar res.—20, Jan. 1 (J.A.McG.) and Blagdon res.—65, Nov. 15 (S.I.B.), 80, Dec. 2 (B.K.B., N.W. *et al.*). Chew Valley returns of 63, Apr. 21; 135, Dec. 16 (B.K.) and 70 on 30th (S.I.B.). At least three broods noted (5, 7 and 10), same place, in period May–July (G.B., P.J.C., B.K.).

SCAUP *Aythya marila*

S. Up to three (1 male), Cheddar res., Jan. 1—15 (H.H.D., J.A.McG. *et al.*). Three (2 males), Chew Valley res., several dates, Jan. 22–Apr. 7, and single male, Oct. 28–Dec. 30 (various observers). Male, Blagdon res., Sept. 22, 29 (C.H.F. *et al.*); female, same place, Nov. 24 (A.G.D.), Dec. 30, and two males, Nov. 25 (P.J.C., M.A.W.).

TUFTED DUCK *Aythya fuligula*

G. Twenty-five on Estuary, New Grounds, Feb. 25 and 87—exceptional number for locality—visited W.T. enclosures, on 28th (H.J.B., P.S.). Party of seven off Severn Beach, Oct. 29 (A.B.C., M.J.W.).

S. Max. reservoir counts: *c.* 200, Cheddar, Jan. 1 and *c.* 100, Dec. 16 (J.A.McG.); 200–250, Blagdon, early Jan. (P.J.C., B.K.) and up to 270, Nov.–Dec. (G.C.B., S.I.B. *et al.*); 47, Barrow Gurney, Feb. 12 (G.E.C.); 227, Chew Valley, Apr. 21 (B.K.) and 275, Dec. 2 (G.C.B.). Twelve on pond, Rickford Coombe, Feb. 25 were probably birds frozen out from Blagdon (N.W.). Observations, late July–early Aug., Chew Valley, show that birds were breeding in numbers far in excess of any yet reported for Somerset ; 13 broods (106 young) counted from roadway, July 29, and 23 broods (142 young), Aug. 4 (P.J.C., M.A.W.), while G.C.B. and S.I.B. counting inside reservoir confines, reported 31 broods (199 young) on following day ; two broods (about 1 week old), same place, Aug. 25 (B.K.).

Pochard *Aythya ferina*

G. Thirty-eight on Estuary, New Grounds, Feb. 25 (H.J.B.). Single male, Cumberland Basin, Bristol, Dec. 29 (J.G. per W.A.H.).

S. Present in large numbers, Cheddar res., Jan.–Feb. (1,050 ± 25, Jan. 15) and Oct.–Dec.—1,000±25, Oct. 28 and *c.* 1050, Dec. 16 (J.A.McG.). Numbers at Blagdon and Chew Valley resrs. considerably smaller, but temporary increases frequently noted after sailing and other disturbances at Cheddar. Max. counts : 930, Blagdon, Jan. 8 (195, Cheddar) and 900, Nov. 3 (B.K.), and 600, Chew Valley, on 4th (470, Cheddar) (G.C.B., S.I.B.). 24 on the lake, Orchardleigh, Jan. 15 (E.D.O.) and single male on pond, Rickford Coombe, Feb. 25 (N.W.).

Goldeneye *Bucephala clangula*

G. Three (1 ad. male) on Estuary, New Grounds, Apr. 29 (H.J.B.).

S. Frequently noted, Cheddar res., Jan.–Feb. with max. totals of 23, Feb. 5 and 26 on 26th (J.A.McG., T.B.S. *et al.*). Seven, Chew Valley res., Jan. 22 (P.J.C.) and nine, Mar. 17 (B.K.). Nine (6 males), Blagdon res., Feb. 5 (P.J.C.).

Long-tailed Duck *Clangula hyemalis*

S. One, female or immature, swimming off Old Pier, Weston-super-Mare, viewed with telescope at 300 yds. range, Nov. 5 (W.L.R.) ; still present on 6th, when seen between pier and Sand Bay (H.R.H.L.).

Velvet Scoter *Melanitta fusca*

S. Party of five (at least 3 males) seen flying close to tide-line, and later on water, between Clevedon and Yeo Estuary, Feb. 12 (B.K.). Only four previous records for N. Somerset (three of single birds and one of two birds)—Eds.

Common Scoter *Melanitta nigra*

S. Two females off Sand Point, Jan. 7 (T.B.S.). Unusually large party inland of eight (7 ad. males), Cheddar res., Sept. 2 (B.K., J.A.McG., T.B.S.) ; single female, same place, Dec. 26 (J.A.McG.).

EIDER *Somateria mollissima*

S. Adult female close inshore off Tower Rock, Steep Holm, May 6 (Res. Stn.).

RED-BREASTED MERGANSER *Mergus serrator*

S. Three (2 ad. males), Chew Valley res., Feb. 19 (B.K.); single redheads, same place, Feb. 26 (G.L.B.), Mar. 11 (G.C.B., S.I.B.) and Cheddar res., Feb. 19, 26 (B.K., J.A.McG.).

GOOSANDER *Mergus merganser*

G. Single bird on Estuary, New Grounds, Mar. 5 (H.J.B.).

S. Up to eight, Blagdon res., various dates, Jan.–Feb. (B.K.B., E.M., J.V. *et al.*). Nine (1 male), Cheddar res., Feb. 4, and nine (3 males) on 12th (J.A.McG.); eleven (2 males), same place, Feb. 19, 26 (B.K., J.A.McG.) and twelve (6 males) on 20th (A.G.D.). From four or five up to nine (max. of 6 males), frequently noted, Chew Valley res., Feb.–Mar. (various observers) and three still present, Apr. 4 (E.G.R.). Two, Barrow Gurney resrs., Mar. 11 (G.E.C.). Up to three reported from the reservoirs in Dec. (W.A.H., M.A.W., N.W. *et al.*).

SMEW *Mergus albellus*

G. Party of 14 (2 ad. males) on Estuary, New Grounds, first week of Feb. (P.S.).

S. Frequently seen, Chew Valley res., Jan.–Mar. with max. total of thirteen (3 ad. males), Mar. 18 (G.L.B., S.I.B., B.K. *et al.*). Up to three reported from Blagdon res., Feb.–Mar. and Nov.–Dec. (various observers), and up to same number, Cheddar res., Feb. and Dec. (J.A.McG., W.L.R).

SHELDUCK *Tadorna tadorna*

G. Count of 145, on Estuary between Oldbury-upon-Severn and Berkeley, June 3 (N.W.).

S. Counts of 300–380 reported, various occasions, Sept.–Nov. from coastal areas—Sand Bay, Axe Estuary (R.A., T.B.S. *et al.*). Three, Blagdon res., Feb. 18, (B.K.B.) and two, same place, several dates, Apr. and June (G.G.C. *et al.*). Up to five reported from Chew Valley, Apr.–May (various observers) and breeding again recorded there—pair with eight ducklings, June 24 (B.K.) —cf. *Brit. Birds*, xlix, p. 280. Single bird, Cheddar res., Oct. 28 (J.A.McG.).

GREYLAG GOOSE *Anser anser*

G. One among White-fronted Geese, New Grounds, Feb. 17 (H.J.B.).

S. What appeared to be a Greylag was seen with party of 14 *A. albifrons*, Clevedon, Feb. 12 (B.K.).

WHITE-FRONTED GOOSE *Anser albifrons albifrons*

G. New Grounds: from total of 1,410 at close of previous year numbers increased to 3,100, Feb. 1, and record total of *c.*5,000 (possibly more) on 27th, but were down to 3,000, Mar. 1 and little more than 400, Mar. 23. Party of six remained, same place, till Apr. 15, while two (one not flying well) stayed throughout summer and were last seen, Aug. 13 (H.J.B.). 100 flying east, Wick, Mar. 17 (D.R.H.). First autumn arrivals, New Grounds: 28, Sept. 24—numbers increasing to 188, Sept. 26; 355, Oct. 27; 850, Nov. 23; and at least 1,700, Dec. 29 (H.J.B.).

S. A few, Chew Valley res., mid-Jan. to mid-Feb., and numbers varying from 200–350, third week of Feb. to Mar. 25 (G.C.B., P.J.C., B.K., R.H.P. *et al.*). One, injured, Cheddar res., Feb. 19 (B.K.B., J.A.McG.) and 250 flying north over Barrow Hill on 26th (P.J.C., M.A.W.). Small numbers (max. 48) reported from Yeo Estuary, Sand Bay and Clevedon, various occasions, Jan. 9–Feb. 26 (R.A., T.B.S., N.W. *et al.*). Party of twelve overhead, Keynsham, Feb. 11 (B.K.).

GREENLAND WHITE-FRONTED GOOSE *Anser albifrons flavirostris*

G. Two, New Grounds, Jan. 9, 10 (H.J.B.) and one, paired to a bird of typical form, Mar. 24, 25 (G.V.T.M.).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Six, possibly eight (at least 2 juveniles), New Grounds, during period Jan. 10–Mar. 12 (H.J.B.)—cf. *Brit. Birds*, xlix, p. 228.

BEAN GOOSE *Anser arvensis*

G. Two, New Grounds, Mar. 9 and one on 11th (P.S.); one, same place, Dec. 29 (H.J.B.).

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. Up to 51 still present, New Grounds, Jan. 1–3; numbers much fewer subsequently, but 24 counted, Jan. 28, and not more than six on any occasion, Feb.—early Mar. First autumn arrivals, same place: 55, Oct. 27; similar totals throughout Nov., with max. of 65 on 11th. One only, Dec. 8 to end of year (H.J.B.).

BARNACLE GOOSE *Branta leucopsis*

G. One with White-fronts, New Grounds, Mar. 11 (D.R.S. per H.J.B.).

CANADA GOOSE *Branta canadensis*

S. Single bird, with White-fronted Geese, Chew Valley res., Mar. 4–25 (various observers).

MUTE SWAN *Cygnus olor*

S. Seventy, R. Avon at Old Bridge, Bath, Mar. 8—average summer population, *c.* 50 (B.K.). Counts of 66–70, Blagdon res., July 22–Aug. 26 (P.J.C., B.K., M.A.W.). Max. totals, Chew Valley res.; 46, Sept. 8 (B.K.) and 45, Oct. 27 (E.G.B.).

WHOOPER SWAN *Cygnus cygnus*

G. First-year bird, New Grounds, Feb. 12–15 (H.J.B.).

S. One with Bewick's Swans, Blagdon res., Feb. 9–Apr. 8 (B.K., A.C.L., J.A.P., W.L.R., J.V. *et al.*)—first record for the reservoir.

BEWICK'S SWAN *Cygnus bewickii*

G. Two in W.T. enclosures or on the Estuary, New Grounds, Feb. 2–Apr. 3, were joined by others to max. number of sixteen, Feb. 13 (H.J.B.). Party of twelve, identified by size and typical call-notes, overhead, Clifton, in early hours of Feb. 24 (P.J.C.).

S. Following advent of severe weather, early Feb., birds reported from the reservoirs in unprecedented numbers; counts from 20 to 40, Blagdon, frequent occasions in period Feb. 9 to Mar. 24, and from 18–53, Chew Valley, in period Feb. 23 to Mar. 24 (various observers). Observations at same reservoirs, Feb. 26, Mar. 4, 11, suggest that at least 100 birds were in the area (G.L.B., P.J.C., B.K., R.H.P. *et al.*). Up to four (immatures) still present, Chew Valley, second week of April (B.K., H.W.N., M.A.W.). Party of eleven, Blagdon res., Nov. 25–Dec. 30 (B.K.B., N.W. *et al.*).

BUZZARD. *Buteo buteo*

G. Survey of 400 sq. kms., covering Severn Vale south of Sharpness, together with adjacent areas north of Bristol to Wickwar and Badminton, revealed only one pair breeding—nest containing single young, nr. Berkeley, June 24 (A.E.B., D.C., D.M.C. *et al.*).

S. Repeat of 1954 Survey area of *c.* 86 sq. kms. showed 8 pairs resident—four young reared from five nests—compared with 9 pairs and five nests in 1954 (before myxomatosis) and only 3 pairs with nests in 1955. Three pairs located in additional areas totalling *c.* 200 sq. kms.—three young reared in one of two nests found (survey by 20 observers).

Sparrowhawk *Accipiter nisus*

S. Female, Steep Holm, Sept. 4 (N.W.) and a male, Nov. 30–Dec. 2 (Res. Stn.).

Hen Harrier *Circus cyaneus*

S. Female or immature, Chew Valley res., Feb. 21, 25, 26 (E.G.B., G.L.B., B.K.). A harrier, of this species or Montagu's, same place, Mar. 8 (J.A.McG.).

Hobby *Falco subbuteo*

G. Single birds, Little Stoke, mid-June (H.H.D.) ; Downend, Aug. 11 and Hambrook on 20th (R.H.P.). Two, Wick, Aug. 27, 30, and one, Sept. 5 (D.R.H.).

S. One over Chew Valley res., Apr. 27 (B.K.).

Peregrine *Falco peregrinus*

G. Single birds, New Grounds, various dates, Jan. to Mar. and mid-Sept. to Dec. (H.J.B. *et al.*). Tiercel, Aust Cliff, Jan. 6 (W.A.H., T.D.H.M.). Pair, at old eyrie, Avon Gorge, early Apr. (C.B., J.H.S.) but tiercel found shot on Somerset side, Apr. 9 (P.F.B.). One over Sea Mills, Aug. 21 (A.C.L.).

S. Many records from coastal localities but no information on breeding. Unusual number of inland records : single birds, Chew Valley, Mar. and Nov.–Dec. (B.K.B., B.K.) ; Blagdon, June 8 (W.L.R.) and first-year bird, Dec. 16—striking but not retrieving a Wigeon *Anas penelope* (P.J.C., M.A.W.) ; falcon, Tickenham, Sept. 6 (P.F.) ; female or imm., Kingston Seymour, Sept. 8 (W.A.H.) ; and Kenn Moor, Nov. 23 (A.G.D.).

Merlin *Falco columbarius*

G. Single birds, New Grounds, Jan. 9 (male), Oct. 30 (H.J.B.).

S. Male, Wavering Down, Compton Bishop, Mar. 4 (W.L.R.).

Red-legged Partridge *Alectoris rufa*

S. Covey of six, Warleigh, nr. Bath, Oct. 16, 1955 (A.G.D.).

Quail *Coturnix coturnix*

G. One seen or heard, Marshfield, July 22, 25, 31 (R.A., A.E.B., P.J.C.).

Corncrake *Crex crex*

S. One calling, Saltford, May 25 (T.H.) and one flushed from stubble, Wrington, Sept. 1 (A.G.D.).

Coot *Fulica atra*

S. Cheddar res. : frequent counts by J.A.McG., W.L.R. *et al.* showed late Feb. peak of 1,700 (26th) ; very few Apr.–Aug., but after usual autumn build-up numbers reached max. total of over 3,000, Dec. 26. Max. counts, Chew Valley res. : 2,000, Feb. 19 ; 1,200, July 7 (exceptional for time of year) ; and 1,500, Dec. 23 (B.K.). Fewer, Blagdon res., than in recent years—highest counts : 660, Dec. 2 (P.J.C.) and 520, Dec. 13, 16 (S.I.B., P.J.C., M.A.W.). Two nests with eggs, Barrow Gurney resrs., June 19, later found destroyed (G.E.C.). Single bird on shore, Sand Point, Feb. 4 (R.A.).

Oystercatcher *Haematopus ostralegus*

G. Three, Oldbury-upon-Severn, July 8 (W.A.H.) and two, New Grounds, Aug. 10 (H.J.B.).

S. 100, Weston Bay, Jan. 22, and 50, Sept. 9 ; 68, Sand Bay, Feb. 2 (R.A.). Eight on landing beach, Steep Holm, Nov. 30 (Res. Stn.). Three, Blagdon res., July 17 (B.W.R.) and one, Aug. 17 (N.W.). Eight, Chew Valley res., Aug. 6 (G.L.B.) and one on 26th (B.K.). Single bird, Cheddar res., Sept. 8 (W.A.H.).

Lapwing *Vanellus vanellus*

G. Two thousand or more, New Grounds, Jan 28 (H.J.B.). Aerial display by 1,000 birds, Oldbury-upon-Severn, Jan. 29 (R.H.P.) ; at least 1,500, same place, Dec. 26 (W.A.H., T.D.H.M.).

S. About 500, Sand Bay, Feb. 4 (R.A.) ; 250, Cheddar res., Aug. 26, and 600, Chew Valley res., Dec. 26 (B.K.).

Ringed Plover *Charadrius hiaticula*

G. *c.* 150, Purton, Sept. 30 (A.C., R.V.C. per C.M.S.).

S. Between 250 and 350, Sand Bay, Aug. 25, 26 (R.A., T.B.S.). Reservoir records include those of three, Cheddar, May 9, and 14, Sept. 2 (J.A.McG.) ; 31, Blagdon, Aug. 19 (P.J.C., M.A.W.) ; and 40, Chew Valley, Aug. 26, Sept. 2 (B.K.).

Little Ringed Plover *Charadrius dubius*

S. Single bird, Blagdon res., Apr. 16 ; under observation for ¾ hour by G.G.C. who has supplied conclusive details ; again reported on 22nd (A.G.D.)—third record for Somerset.

Grey Plover *Charadrius squatarola*

G. Eight, Purton, Sept. 23 and four, Oct. 21 (D.B.P.S.). Two, Severn Beach, Oct. 29 (G.C.B., S.I.B.).

S. Three, Sand Bay, Feb. 18 (R.A.). Single birds, Clevedon, Feb. 12 (B.K.), and Yeo Estuary on 26th (B.K.B.). Inland records of one, still in breeding plumage, Cheddar res., Sept. 2, and two, in flight, on 16th (J.A.McG.).

GOLDEN PLOVER *Charadrius apricarius*

G. Nine, Hambrook, Feb. 14 (R.H.P.).

S. 110, Chew Valley res., Jan. 2 (G.M.). Up to 200, Lulsgate aerodrome, Oct.–Dec. (S.I.B., N.W.), and 110, Kewstoke, Dec. 26 (T.B.S.).

TURNSTONE *Arenaria interpres*

G. At least 30, Sheperdine, Jan. 22, and 12, Nov. 4; four, Purton, May 10 (D.B.P.S.).

S. Three, Sand Bay, Aug. 25 (R.A.). Single bird, Cheddar res., Aug. 19 (B.K.) and two, Sept. 13 (J.A.McG.). One, Chew Valley res., Aug. 25 (B.K.).

JACK SNIPE *Lymnocryptes minimus*

S. Two, Chew Valley res., Jan. 5 (G.M.) and one, Mar. 4 (B.K.).

WHIMBREL *Numenius phaeopus*

S. Up to 30, Sand Bay area, Apr.–May (R.A., T.B.S.). Fourteen, Kenn Moor, May 6 (W.A.H.). Reservoir records of one, Blagdon, Apr. 22, and three, Chew Valley, Aug. 26 (B.K.).

BLACK-TAILED GODWIT *Limosa limosa*

G. Three, Sheperdine, Apr. 7 (T.D.H.M.). Eight, New Grounds, July 25, and 13, Aug. 21 (H.J.B.).

S. One, Sand Bay, Aug. 7 (T.B.S.). Three, Chew Valley res., July 18 (T.B.S.) and two in breeding plumage on 20th (B.K.); single birds, same place, Aug. 18 (G.C.B., S.I.B.), Sept. 2 (B.K.).

BAR-TAILED GODWIT *Limosa lapponica*

G. An exhausted bird, caught by hand, Aust, Feb. 2 (E.M.). Three, Purton, Sept. 23 and one, Oct. 10 (D.B.P.S.).

S. One, Kingston Seymour, May 6 (W.A.H.). Single birds, Sand Bay, Feb.–Mar. and Sept.–early Oct. (R.A., T.B.S.).

GREEN SANDPIPER *Tringa ochropus*

S. Single birds, Kenn Moor, Mar. 25 (B.K.B.) and Wick St. Lawrence, July 29 (T.B.S.). Frequent, Chew Valley res., July to Sept.—usually three or four (various observers) but 13, Aug. 12 (P.J.C., M.A.W.) and eight, Sept. 8 (P.J.C.) ; two, same place, Nov. 24, and four, Dec. 26 (B.K.). Five, Blagdon res., Aug. 10 (N.W.) and two, Aug.–Sept. (various observers) ; single bird, same place, Nov. 23 (T.B.S.).

WOOD SANDPIPER *Tringa glareola*

S. Three, Woodspring Bay, Sept. 2 (T.B.S.). One, Chew Valley res., Aug. 25 (P.J.C.) and Sept. 22 (C.H.F., B.K.).

REDSHANK *Tringa totanus*

G. Nest, containing newly hatched young, on river bank, Berkeley, June 3 (N.W.).

S. Max. coastal counts of 170, Sand Bay, Jan. 28 (R.A.) and 230, Oct. 28 (T.B.S.). Three, Chew Valley res., Apr. 7 (B.K.) and four pairs, Apr. 10 (G.L.B.), 21 (B.K.). Two, Blagdon res., June 1 (E.G.B.). Single bird, Barrow Gurney resrs., July 28 (J.A.F.W.) and two, Cheddar res., Aug. 5–12 (T.B.S.).

SPOTTED REDSHANK *Tringa erythropus*

S. Wintering bird, Chew Valley res., Jan. 15–Feb. 12 (G.C.B., S.I.B., R.H.P.) ; up to seven, same place, Aug. 25–Sept. 22 (P.J.C., C.H.F. *et al.*), and two, Oct. 26 (G.M.). Two, Cheddar res., Aug. 25, 26 (B.K.). Up to six, possibly birds from Chew Valley, seen Blagdon res., several occasions, Aug. 28–Nov. 4 (B.K.B., G.C.B., N.W.) ; one wintering, same place, Dec. 2, 30 (various observers).

GREENSHANK *Tringa nebularia*

S. Twice noted on spring passage—single bird, Blagdon res., May 21 (B.K.) and Chew Valley res. on 28th (G.B.). Frequently reported from the reservoirs on autumn passage with peak total of 17, Chew Valley, Aug. 25 (G.C.B., G.E.C., B.K. *et al.*). One, Blagdon res. as late as Nov. 3 (B.K.).

KNOT *Calidris canutus*

G. Three, New Grounds, Jan. 16 (H.J.B.).

S. 122, Sand Bay, Feb. 18 (T.B.S.) ; 14, same place, Mar. 17, and three, Sept. 23 (R.A.). *c.* 40, Yeo Estuary, Sept. 15 (T.B.S.). Single bird, Cheddar res., Sept. 2, 13 (B.K., J.A.McG., T.B.S.).

LITTLE STINT *Calidris minuta*

S. Three, Sand Bay, Sept. 9 ; two, same place, Sept. 23 and one on 30th (T.B.S.). Two, Cheddar res., Sept. 2 (J.A.McG., T.B.S.).

DUNLIN *Calidris alpina*

G. About 1,000, Severn Beach, Oct. 29 (G.C.B., S.I.B.).

S. One ringed, Ottenby, Sweden, 1/8/49, found dead, Clevedon, 29/11/52—cf. *Brit. Birds*, xlix, p. 447.

Reported from the reservoirs on both passages with max. total in spring of 14, Chew Valley, May 10 (J.A.McG.), and max. autumn counts of 52, Blagdon, Aug. 22 (M.A.W.) and 60, Chew Valley on 26th (B.K.).

CURLEW SANDPIPER *Calidris testacea*

S. Up to fifteen, Sand Bay, Sept. 9–30 (R.A., T.B.S.). Single bird in partial summer plumage, Blagdon res., Apr. 27 (B.K.)—few spring records for Somerset. One, Cheddar res., Sept. 2 (B.K.). Party of 10, Chew Valley res., Sept. 8 (E.G.R.)—an exceptional number inland; three—one in partial summer plumage—still present on 9th (B.K.).

SANDERLING *Crocethia alba*

S. Six in partial summer plumage, Cheddar res., May 9 (J.A.McG., T.B.S.) and four, same place, Sept. 1 (P.J.C.). Party of eleven, Sand Bay, Aug. 19 (T.B.S.).

RUFF *Philomachus pugnax*

G. Six, New Grounds, Sept. 7 (M.D. per H.J.B.).

S. Two, Chew Valley res., Aug. 11, 25 (B.K.B. *et al.*); 12, same place, Sept. 2 (B.K.), and one with injured wing, Oct. 30, Nov. 7 (S.I.B.). Single bird, Blagdon res., Nov. 3 (N.W.) and Dec. 2 (B.K.B.).

GREAT BLACK-BACKED GULL *Larus marinus*

S. Seventy-four occupied nests, Steep Holm, May 4–6 (Res. Stn.)—figure of 43 nests obtained May, 1955 (cf. *Proc. B.N.S.*, 1955, p. 121) in all probability result of incomplete census. Adult carrying nesting material into long grass, temporary island, Chew Valley res., June 15, and pair behaving similarly on 20th (B.K.). Although no direct evidence of breeding, single ad. with juvenile on main island, Chew Valley, Sept. 16 (P.J.C.). Four pairs breeding on the Denny (2 m. off Portishead but in county of Mon.) (R.H.P.).

LESSER BLACK-BACKED GULL *Larus fuscus graellsii*

S. Estimated breeding population of 625 pairs, Steep Holm, May 4–6,—ascertained by applying ratio of adult Lesser Blackbacks to Herring Gulls (obtained from field counts) to results of complete census of nests (Res. Stn.). Size of breeding population, Chew Valley res., not exactly determined but observations by B.K. suggest that at least 17 pairs bred. Large numbers roosting, Chew Valley res. in autumn—peak count of 770, Oct. 7, with 700 as late as Nov. 24 (B.K.).

SCANDINAVIAN LESSER BLACK-BACKED GULL *Larus fuscus fuscus*

S. Two Lesser Black-backs viewed at very close range, Blagdon res., Apr. 2 had uniformly dark upper-parts and were considered to be of this form (B.K.).

HERRING GULL *Larus argentatus*

S. Census of nests, Steep Holm, May 4–6 showed breeding population to be *c.* 3,550 pairs. First-year bird ringed, Steep Holm, 10/3/56, recovered, Courtown Harbour, Co. Wexford, –/4/56; nestling ringed, same place, 10/7/52, reported nr. Wakefield, Yorks, 180 m. N.N.E., 3/6/56; and adult marked 14/3/53, found dead, Craven Arms, Shropshire, 76 m. N., 6/5/56 (Res. Stn.).

COMMON GULL *Larus canus*

S. Approx. 3,500 counted flying in to roost, Chew Valley res., Jan. 22 (P.J.C., R.H.P.). *c.* 500 feeding on pasture, Charterhouse, Dec. 26 (P.J.C. *et al.*).

LITTLE GULL *Larus minutus*

S. First-year bird, Chew Valley res., Aug. 26 (B.K.).

BLACK-HEADED GULL *Larus ridibundus*

S. Roost counts, Chew Valley res. include: 2,750, Jan. 22 (P.J.C., R.H.P.) and 1,000, Nov. 24 (B.K.).

KITTIWAKE *Rissa tridactyla*

G. Remains of adult, riverbank, Avonmouth, Feb. 19 (R.H.P.).

S. Two dead juveniles, Cheddar res., and another, Woodspring Bay, Aug. 5 (T.B.S.). Oiled adult, alive but in weak condition, Chew Valley res., Dec. 16 (B.K.).

BLACK TERN *Chlidonias niger*

G. Party of eight, New Grounds, July 17 (H.J.B.).

S. One, Chew Valley res., June 27 (B.K.). Few Aug. records from reservoirs—max. total of 12, Aug. 25, 26. Sudden heavy passage, Sept. 2 when over 160 reported—40, Barrow Gurney; 2, Blagdon; 10, Cheddar; and 115, Chew Valley: on following day total of 74 reported (68, Chew Valley and 6, Barrow Gurney), and 16 on 4th; small numbers thereafter to Oct. 7 (various observers). Single bird, Cheddar res., Oct. 28 (T.B.S. *et al.*).

On Sept. 2 there was a sudden influx at the reservoirs of this species, together with other terns *Sterna* spp., totalling some 230 birds. Examination of the weather data at this time shows that following a wet, unsettled Aug. with W.—S.W. winds, high pressure with generally light winds developed to the north and over Scandinavia, and on Sept. 1 the western seaboard of the British Isles came under the influence of a freshening north-easterly air stream. A depression over the Bay of Biscay moved north to become situated over Cornwall on the 3rd—the accompanying area of dull, rainy weather covering France, Belgium and adjacent areas, and moving into southern and south-eastern England. This meteorological environment was very similar to that which marked the influx of Black Terns to Britain in the autumn of 1955 (cf. *Brit. Birds*, xlviii, pp. 300–307).

COMMON TERN *Sterna hirundo* ARCTIC TERN *Sterna macrura.*

S. Spring records of one, Blagdon res., May 13 (G.C.B., S.I.B.) and one, Chew Valley, June 15 (B.K.). More frequent on return passage—extreme dates, July 29–Oct. 7. Up to four at reservoirs in August with total of 9 on 26th. Marked influx (see above) on Sept. 2, with total of 62 reported (6, Barrow Gurney; 7, Blagdon; 4, Cheddar; and 45, Chew Valley) and 15 on 8th (various observers). Six off Steep Holm, Sept. 29 (Res. Stn.). Terns specifically identified: *hirundo* records—two, Blagdon, Aug. 18, and up to four, Cheddar, Aug. 25–Sept. 14 (B.K.); *macrura* records—single birds, Cheddar, Aug. 25, Sept. 9, 14 (B.K., J.A.McG.), and Chew Valley, Sept. 2 (P.J.C., M.A.W.).

LITTLE TERN *Sterna albifrons*

S. Two, Chew Valley res., Sept. 2 (G.C.B., S.I.B., B.K.) and one on 8th (B.K.). Two, Cheddar res., Sept. 9 (B.K.B., J.A.McG.).

SANDWICH TERN *Sterna sandvicensis*

S. One, Chew Valley res., Sept. 2 (G.L.B., B.K.).

WOODPIGEON *Columba palumbus*

S. Single birds, Steep Holm, Mar. 10, Apr. 7 (Res. Stn.): few records for the island—cf. *Proc. B.N.S.*, 1955, p. 124.

SHORT-EARED OWL *Asio flammeus*

G. One, New Grounds, Aug. 12 and another, Dec. 13 (H.J.B.).

SWIFT *Apus apus*

G. Fewer in Bristol suburbs than in recent years—population at Downend being reduced to *c.* 50 per cent. of normal (R.H.P.). One, Filton, Sept. 8 (R.A.).

S. Nine, Barrow Gurney resrs., Sept. 2 (G.E.C.). Other September records of single birds, Steep Holm on 6th (N.W.), Cheddar res. on 15th (J.A.McG.) and Kewstoke on 23rd (T.B.S.).

KINGFISHER *Alcedo athis*

S. Single birds, R. Chew, Publow, May 21, Aug. 30 (E.G.B.). Reported outside breeding season from Barrow Gurney, Chew Valley and Litton resrs. (various observers).

HOOPOE *Upupa epops*

G. One in flight across County Cricket Ground, Ashley Down, Bristol, July 31 (A.C.L.). Another reported feeding on lawn, Sneyd Park, Bristol, Aug. 7 (per S.H.G.B.) was seen on 10th by S.H.G.B. and H.W.N. One on lawn, Syston Court, Aug. 11, 12 (H.W. per D.M.).

S. One, Hursley Hill, Whitchurch, May 14 (R.R.).

GREEN WOODPECKER *Picus viridis*

G. Two, disturbed whilst feeding from two bottles of milk, Brentry, Nov. 28—each metal top perforated by a single large hole, and about one inch of cream removed from each bottle (G.R.M. per R.H.P.).

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. Single birds, Bitton, Mar. 5, Apr. 10 (J.A.L.); Wotton-under-Edge, Sept. 13, 16, Oct. 14 (D.B.P.S.) and Syston Court, Sept. 16 (H.W. per D.M.).

S. Two, Chew Valley res., Feb. 25 (B.K.). Single birds reported from Blagdon res., Feb. 26 (B.K.), Aug. 6 (T.B.S.); Wookey, Mar. 26; Worth (nr. Wookey), Apr. 1 (J.A.McG.); Kenn Moor, Apr. 21 (R.A.); Saltford, June 29 (B.K.); Woodspring, Aug. 7 (R.A.); Long Ashton, Sept. 18 (M.A.W.); and Kewstoke, Nov. 21 (T.B.S.).

WRYNECK *Jynx torquilla*

G. One in grounds of H.M. Prison, Leyhill, Tortworth, Sept. 10, 11 (D.B.P.S.).

WOODLARK *Lullula arborea*

G. One, Wotton-under-Edge, Jan. 20, Sept. 2, and four, Nov. 4; one, North Nibley, Aug. 19; and two pairs, Dursley, Apr. 22 (D.B.P.S.).

S. One heard, Brockley Combe, Mar. 18 (P.J.C.).

RAVEN *Corvus corax*

G. Reported in ones and twos from Purton—New Grounds area, Jan.–Feb. and again on Nov. 23 (H.J.B. *et al.*). Two, Stinchcombe, May 5 (D.B.P.S.).

S. One, Tickenham Hill, Jan. 15 (R.G.H.). Reported from Brean Down, Steep Holm and Sand Point (various observers) but the only breeding record is from Brean Down (W.L.R.).

CARRION CROW *Corvus corone*

G. Occupied nest on Helicopter Rotor Testing Tower, Filton aerodrome, May 4 (R.A.).

S. Three, Steep Holm, Mar. 9, and nest with 3 eggs (later deserted) found in sycamore, May 4 (Res. Stn.). Three young reared in nest on metal framework of arc lamps attached to hangar, Whitchurch Airport (J.B. per G.B.).

ROOK *Corvus frugilegus*

S. One nest on electricity pylon, Uphill, Apr. 9 (W.L.R.).

WILLOW TIT *Parus atricapillus*

G. One, clearly identified, feeding in orchard, Oldbury-upon-Severn, Jan. 29 (R.H.P.).

DIPPER *Cinclus cinclus*

G. Occasional records—single birds only—R. Boyd, Wick, throughout year (D.R.H.).

S. Nesting again reported on R. Chew (G.B., T.H.). One by entrance to Wookey Hole cave, R. Axe, Dec. 18 (J.A.McG.).

SONG THRUSH *Turdus philomelos*

G. Nestling ringed on Clifton Down, Bristol, 25/4/48, found dead, Clifton, 9/5/56 (R.H.P.).

BLACKBIRD. *Turdus merula*

G. One ringed as juvenile, Mangotsfield, 2/6/56, recovered 32 m. E.S.E. at Pewsey, Wilts, 10/9/56 (D.M.C.).

WHEATEAR *Oenanthe oenanthe*

S. Bred successfully, Wavering Down, Compton Bishop—three pairs each with two young; fourth pair also present, June 10 (P.J.M.N.).

STONECHAT *Saxicola torquata*

G. and **S.** Numerous winter and autumn reports, but only one breeding record—brood of young, Brean Down, July 21 (P.J.C.).

REDSTART *Phoenicurus phoenicurus*

G. Single male, Stoke Gifford, Mar. 30; for previous record on such an exceptionally early date—see *Proc. B.N.S.*, 1955, p. 126 (H.H.D.).

BLACK REDSTART *Phoenicurus ochruros*

S. Single females or immatures, Sand Point, Jan. 28, Feb. 4, 18, Mar. 17 (R.A.); Lansdown, Bath, Mar. 17 (G.G.C.); Uphill, Mar. 19 (T.B.S.); and Brean Down, Nov. 11 (P.J.C., M.A.W.).

ROBIN *Erithacus rubecula*

S. Three, Steep Holm, Mar. 10–12; none recorded, Apr. May, June, but at least 10 holding territories, Sept. 29–30 (Res. Stn.)—cf. also *Proc. B.N.S.*, 1953, p. 401.

GRASSHOPPER WARBLER *Locustella naevia*

G. Breeding season records from Michaelwood, nr. Tortworth, Wotton-under-Edge, and Owlpen, nr. Uley (D.B.P.S.).

S. Single birds, Shiplate, May 5 and Brean Down, June 11 (R.A.). At least 6 singing birds, Rowberrow plantation, May 6 (N.W.).

LESSER WHITETHROAT *Sylvia curruca*

S. Nest with eggs, Chewton Keynsham, May 27 (G.B.).

WOOD WARBLER *Phylloscopus sibilatrix*

G. Two singing males, Dursley—probably bred (D.R.H.) and one, Michaelwood, Tortworth, May 27, June 9 (D.B.P.S.).

S. Ten singing males, Leigh Woods—three nests located (P.J.C.). Fourteen singing males recorded in area of 182½ sq. kms. between Bristol-Clevedon-Congresbury-Blagdon and south to Priddy, Mendip (survey by 15 members).

GOLDCREST *Regulus regulus*

S. One, Steep Holm, Sept. 29—trapped and ringed on 30th; one, same place, Dec. 1 (Res. Stn.).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. Pair, Wotton-under-Edge, May 4 (D.B.P.S.).

S. Adult male, Bleadon, Apr. 15–19 and on 26th (E.H.C.). Single female, Brockley Combe, Apr. 28 (B.K.).

ROCK PIPIT *Anthus spinoletta petrosus*

S. Sixteen, Steep Holm, Mar. 9–12 (Res. Stn.).

WATER PIPIT *Anthus spinoletta spinoletta*

S. Two, Cheddar res., Apr. 1–3 (B.K., J.A.McG. *et al.*)—detailed descriptions received.

RED-BACKED SHRIKE *Lanius collurio*

S. Bred nr. Cheddar res. (J.A.McG.). Female, nr. Leigh Woods, June 9 (P.J.C.).

GOLDFINCH *Carduelis carduelis*

S. Adult feeding fledged young, Kewstoke, as late as Sept. 23 (T.B.S.).

SISKIN *Carduelis spinus*

G. Two, Wotton-under-Edge, Jan. 6, and Old Decoy, Purton, Mar. 17 (D.B.P.S.).

LESSER REDPOLL *Carduelis flammea cabaret*

S. Five in silver birches, Blagdon res., Jan. 8, and two, Oct. 7 (B.K.).

CHAFFINCH *Fringilla coelebs*

G. South-westerly movement, Aust Cliff, Oct. 21—1,865 counted, of which 1,783 flying S.W., 0630–1000 G.M.T.; wind W.S.W., force 3–4 (B.K.B., P.J.C., M.A.W.).

S. One ringed, Long Ashton, 12/2/55, found dead, Leksand (Copparberg), Sweden, 26/8/56 (G.E.C.).

BRAMBLING *Fringilla montifringilla*

G. Up to fifty along riverbank, Shirehampton–Avonmouth, Feb. 12, 19 (R.H.P.).

S. Selected records—up to 100, Chew Valley res., Feb. 5–Mar. 19 (G.L.B., B.K.); approximately 60, Hutton, Feb. 23 (W.L.R.).

CORN BUNTING *Emberiza calandra*

G. One, Nympsfield, Apr. 12, and four, Bagpath, Oct. 15 (D.B.P.S.). Two singing males, Hawkesbury Upton, Apr. 15 (P.J.M.N.).

S. One, Lansdown, Bath, Mar. 24 (G.G.C.).

Cirl Bunting *Emberiza cirlus*

S. Breeding season records: two, Bleadon, May 4 (W.L.R.); single birds, Sand Point, May 5 (T.B.S.) and Wrington, May 12, 26 (P.J.M.N.). Probably bred, Monkton Combe (A.G.D.).

Reed Bunting *Emberiza schoeniclus*

S. Bred, Chew Valley res. (G.L.B.). One, female or immature, Steep Holm, Sept. 30, arrived with migrating passerines from Flat Holm direction; this or another seen later on plateau (Res. Stn.).

Lapland Bunting *Calcarius lapponicus*

G. One, a first winter female, found in an outhouse, Wotton-under-Edge, in October, was identified by J.R.L. and C.M.S.; identification confirmed from outer tail feather sent to Brit. Museum (Nat. Hist.). Its behaviour, and appearance, was that of a wild bird, but it should be noted that the species is sometimes kept in captivity and that the bird had flown into a shed housing Canaries and other cage-birds.

House Sparrow *Passer domesticus*

G. Adult male ringed, Hambrook, 21/10/52, found dead, same place, 2/6/56 (R.H.P.).

Tree Sparrow *Passer montanus*

G. Breeding records from Little Stoke (H.H.D.) and Hambrook (R.H.P.).

BRISTOL BIRD REPORT, 1955

ERRATA

Mallard	**S.**, line 6—for Sept. 18, 25 read Sept. 18.
Scaup	**S.**, line 3—for Dec. 19–21 read Dec. 26.
Pochard	**S.**, line 1—for Jan. 5 read Jan. 15. **S.**, line 3—for Mar. 13 read Nov. 13.
Moorhen	**G.**, line 2—add date, Nov. 6.
Turnstone	**S.**, line 3—one, Aug. 20 (B.K.B.) should read three, Aug. 29 (G.L.B.).
Dunlin	**S.**, line 1—for Jan. 1 read Jan. 15.
Sanderling	**S.**, line 1—for May 5 read May 5–9.
Lesser Black-backed Gull	**S.**, line 13—for July 7 read July 30.
Rook	**S.**, line 3—for 92 read 56. line 4/5—for same size read 17 nests.

LEPIDOPTERA NOTES
BRISTOL DISTRICT, 1956

By C. S. H. Blathwayt, M.A., F.R.E.S.

AFTER a mild January and exceptionally cold February the Spring months were dry but generally rather cold. The Summer months were, however, wet and there were no long periods of fine weather. The Autumn was fine and the year ended with a moderate December.

The year was a bad one so far as butterflies were concerned, but was on the whole surprisingly good for moths, some interesting species being taken in the area. Perhaps the best capture was of a specimen of *Cosymbia pupillaria* at Weston in late September.

The following notes are taken from records supplied by Dr. A. M. Campbell (A.M.C.), Messrs. G. H. W. Cruttwell (G.H.W.C.), H. W. Bird (H.W.B.), and also from my own records (C.S.H.B.). As all the Weston records are my own and virtually all those from Clevedon are by H. W. Bird I have omitted initials after records from these two places, except in one case from Clevedon where the record is my own.

Aglais urticae Linn. (Ab. *Pallida*) (Small Tortoiseshell). Frome, Mar. 9 (G.H.W.C.).

Acherontia atropos Linn. (Death's-head Hawk). One at light, Weston, Aug. 7.

Herse convolvuli Linn. (Convolvulus Hawk). Two at light, Weston, Sept. 10 and 14, and two reported from Bristol in Sept. (P. Bird).

Clostera curtula Linn. (Large Chocolate-tip). Two at light, Weston, May 19 and 21, and two at light at Clevedon in May.

Tethea ocularis Linn. (*octogesima* Hubn.) (Figure of Eighty). A few at light, Clevedon, in June.

Pseudoips bicolorana Fuessl. (*quercana* Schiff.) (Scarce Silver-lines). Several at light, Weston in July.

Spilosoma urticae Esp. (Water Ermine). One at Clevedon at light, June 20, Several at Shapwick at light in early June (A. Richardson).

Cybosia mesomella Linn. (Four-dotted Footman). One at Clevedon at light June 27. Common at Shapwick in June (C.S.H.B.).

Lithosia quadra Linn. (Large Footman). 27 at light, Weston, July 19–27, and another on Sept. 23. Three at light, Clevedon, July 27.

Apatele leporina Linn. (Miller). One at light, Weston, July 27.

Agrotis ripae Hubn. (Sand Dart). Common at Sugar Berrow, June 23 and July 21 (C.S.H.B.).

Actebia praecox Linn. (Portland Dart). One at light, Clevedon, July 8 and another at Weston, Aug. 17.

Graphiphora augur Fabr. (Double Dart). One at light, Weston, July 19.

Amathes ditrapezium Borkh. (Triple-spotted Clay). Three at Clevedon in June and July. One at Weston, July 19.

Anaplectoides prasina Fabr. (Green-arches). Two at light, Clevedon, late June. Three at light, Weston, late June and early July.

Hadena suasa Schiff. (*dissimilis* Knoch) (Dog's-tooth). Fairly common at light, Clevedon and Weston, May to August.

Hadena contigua Vill. (Beautiful Brocade). Two at light, Clevedon, June 28 and July 17.

Hadena bombycina Hufn. (*glauca* Hubn.) (Glaucous Shears). One at light, Clevedon, May 30.

Hadena conspersa Esp. (*nana* Rott.) (Common Marbled Coronet). Fairly Common at light, Clevedon, late May to early July. Two at light, Weston, May 14 and 23.

Procus literosa Haw. (Rosy Minor). One at light, Clevedon, Aug. 9. A few at light, Weston, July–Aug.

Apamea furva Hubn. (Confused Brindle). One at light, Weston, July 10.

Apamea unanimis Hubn. (Small Clouded Brindle). Fairly common Clevedon, in June.

Apamea sublustris Esp. (Reddish Light Arches). A few at light, Weston and common at Clevedon, June and July.

Apamea scolopacina Esq. (Slender Brindle). One at light, Weston, July 19.

Dasypolia templi Thunb. (Brindled Ochre). One at light, Weston, Oct. 11.

Hydraecia paludis Tutt (Saltern Ear). Several at light, Clevedon and Weston in August.

Chilodes maritima Tausch. (Silky Wainscot). One at light, Clevedon, Aug. 8.

Leucania littoralis Curt. (Shore Wainscot). Common at dusk and at Sugar Berrow, June 23 and July 21 (C.S.H.B.).

Cosmia pyralina View. (Lunar-spotted Pinion). One at light, Clevedon, July 17 and another at light, Leigh Woods (A.M.C.).

Cosmia affinis Linn. (Lesser-spotted Pinion). One at light, Weston, Aug. 19.

Zenobia subtusa Fabr. (Olive Kidney). One at light, Clevedon, Aug. 8.

Orthosia populeti Treits. (Lead-coloured Drab). Several at Sallow, Clevedon, April 7 (C.S.H.B.).

Orthosia advena Schiff. (*opima* Hubn.) (Northern Drab). One at light, Clevedon, May 2.

Anchoscelis litura Linn. (Brown-spot Chestnut). One at light, Weston, Sept. 20.

Cirrhia gilvago Esp. (Dusky-lemon Sallow). Several at light, Weston, Sept. and early Oct. and also Leigh Woods (A.M.C.).

Lithophane semibrunnea Haw. (Tawny Pinion). One at Ivy, Dyrham, Nov. 3 (C.S.H.B.).

Lithophane socia Rott. (Pale Pinion). Several at light and Ivy, Weston, late Sept. and Oct.

Pyrrhia umbra Hufn. (Bordered Orange). Four at light, Clevedon, June and July.

Heliothis peltigera Schiff. (Dark Bordered Straw). One at light, Weston, Sept. 24.

Heliothis armigera Hubn. (Scarce Bordered Straw). Two at light, Weston, Sept. 23 and 24.

Lygephila pastinum Treits. (Plain Blackneck). Several at light, Clevedon in July and one at Weston, July 9.

Herminia barbalis Clerck (Common Fanfoot). One at light, Clevedon, June 24.

Bomolocha fontis Thunb. (Beautiful Snout). One at light, Clevedon, June 27.

Sterrha dilutaria Hubn. (*holosericata* Dup.) (Silky Wave). A few, Bristol, July 21 (C.S.H.B.).

Sterrha trigeminata Haw. (Treble-spot Wave). Fairly common at light, Clevedon, June and July.

Cosymbia puppillaria Hubn. (Blair's Mocha). One at light, Weston, Sept. 24.

Nothopteryx polycommata Hubn. (Barred Tooth-striped). Several at rest, Abbots Leigh, March 30 and Apr. 7 (C.S.H.B.).

Philereme vetulata Schiff. (Brown Scallop). Several at light, Clevedon and Weston, July.

Philereme transversata Hufn. (*rhamnata* Schiff.) (Dark Scallop). Several at light, Weston, in July.

Thera variata Schiff. (Grey Spruce Carpet). One at light, Clevedon, June 23 and another at Weston, Sept. 24.

Discoloxia blomeri Curt. (Blomer's Rivulet). A few at light, Clevedon and Weston, June and July.

Perizoma bifaciata Haw. (*unifasciata* Haw.) (Barred Rivulet). A few at light, Clevedon, late May and late July and early Aug.

Eupithecia tantillaria Boisd. (*pusillata* Fabr) (Dwarf Pug). Three at light, Clevedon in June.

Eupithecia succenturiata Linn. (Bordered Pug). One at light, Clevedon, July 21.

Abraxas sylvata Scop. (Clouded Magpie). Common at light, Weston in June and July and one as late as Sept. 10.

Selenia lunaria Schiff. (Lunar Thorn). One at light, Weston, June 7.

Apocheima hispidaria Fabr. (Small Brindled-beauty). A few at light near Glastonbury, Mar. 3 (C.S.H.B.).

Margaronia unionalis Hubn. (Scarce Olive-tree Pearl). Three at light, Weston, late Sept. and early Oct.

Donacaula mucronellus Schiff. (Scarce Water-veneer). One at Clevedon on June 20.

Nymphula stratiotata Linn. (Ringed China-mark). One at Clevedon on July 8.

Diasemia litterata Scop. (Lettered China-mark). One at Clevedon on Aug. 10.

Dioryctria abietella Fabr. (Pine Knot-horn). Two at Clevedon in August.

Chilo phragmitellus Hubn. (Wainscot Grass-veneer). One at Clevedon on June 23.

Alucita galactodactyla Schiff. (Spotted White Plume). Larvae and pupae found, Goblin Coombe, May 30 (H.W.B.).

STUDIES ON THE BIOLOGY OF THE BRISTOL CHANNEL

XVIII

THE MARINE FAUNA AT FIVE STATIONS ON THE NORTHERN SHORES OF THE BRISTOL CHANNEL AND SEVERN ESTUARY

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INTRODUCTION

THE writer has been interested in the distribution of the estuarine and marine fauna of the Severn Estuary and the Bristol Channel since 1937 when he studied the beach at Portishead, near Bristol (Purchon, 1937). Since that date there has been a series of publications on the distribution of the fauna of the Southern Shores of the Bristol Channel (" Studies on the Biology of the Bristol Channel ", in the Proceedings of the Bristol Naturalists' Society), largely produced by members of the Department of Zoology, University of Bristol.

Between October 1945 and June 1950 attention was turned to the Northern Shores of the Bristol Channel. Beaches within easy reach of Cardiff were first studied in order to make the most rapid progress (Purchon, 1947). Between 1947 and 1950 efforts were made to extend the survey higher up the Channel and into the estuary of the Severn, and also further out towards the open sea.

At the same time, with much outside assistance, an attempt was made to estimate the seasonal variations in salinity to which the shores of South Wales and Monmouthshire are subjected, since variation in salinity is probably the primary factor in determining the distribution of intertidal species along the shores of an estuary.

These studies were brought to a close when the writer took up an appointment overseas. The survey at Dale Fort was well advanced, but the surveys at Llantwit Major, Kenfig, Marros, and the Mumbles were far from complete. Since the writer will have no further opportunity of completing these surveys, and since even these preliminary data contain much that is new, it is thought desirable to publish the records up to date, in the hope that their very incompleteness will encourage others to continue the surveys,

The writer wishes to express his sincere thanks to the following:—

The University of Wales, for defraying the cost of a boat for trawling in Swansea Bay.

Mr. Garner, Coxswain of the Mumbles Lifeboat, for his co-operation in boatwork in Swansea Bay.

The Officers of the Coastguard Station at Rhossili, Gower, Miss Joan Bishop at Port Talbot, Miss Edith Bruce at Monk Nash, the Pier Master at Penarth, and Mr. H. H. Howells at Lydney, for their kindness in collecting water samples for the estimation of salinity at regular intervals over a period of twelve months and often at considerable personal inconvenience.

Mr. G. D. Waugh for co-operation in field work at The Mumbles and at Llantwit Major.

Mr. Gareth Owen, Mr. T. D. Iles and Miss J. Bishop and many other students in the Department of Zoology, University College, Cardiff for their help in collecting and identifying specimens at Portskewett, Llantwit Major and Kenfig.

SALINITY

Water samples were collected at various stations along the northern shores of the Bristol Channel, and were sent to University College, Cardiff, where the salinity was determined. The samples taken at each station were as follows :—

Worms Head, Gower. Spring and neap tide samples were taken from the shore once a month from August, 1948 till May, 1949. There was no apparent seasonal variation in salinity, nor any consistent differences between spring and neap tides. Variations in salinity between the extremes recorded of 31.5 and 33.5 parts per thousand appeared to be random, but may have been due to variations in local rainfall.

Port Talbot. Spring and neap tide samples were taken from the shore once a month from June, 1948 till April, 1949. Variation in salinity appeared to be random between the extremes of 28.3 and 32.2 °/oo.

Monk Nash. Spring and neap tide samples were taken from the shore in June, September, and December, 1948 and in April, 1949. At this station there appeared to be a slight seasonal change in salinity, which was above 30 °/oo during early and late summer, and below this level in the winter and spring. The data are not adequate on this point. Salinity varied between 27.5 and 31.5 °/oo.

Penarth Pier. Weekly samples were taken from the end of the

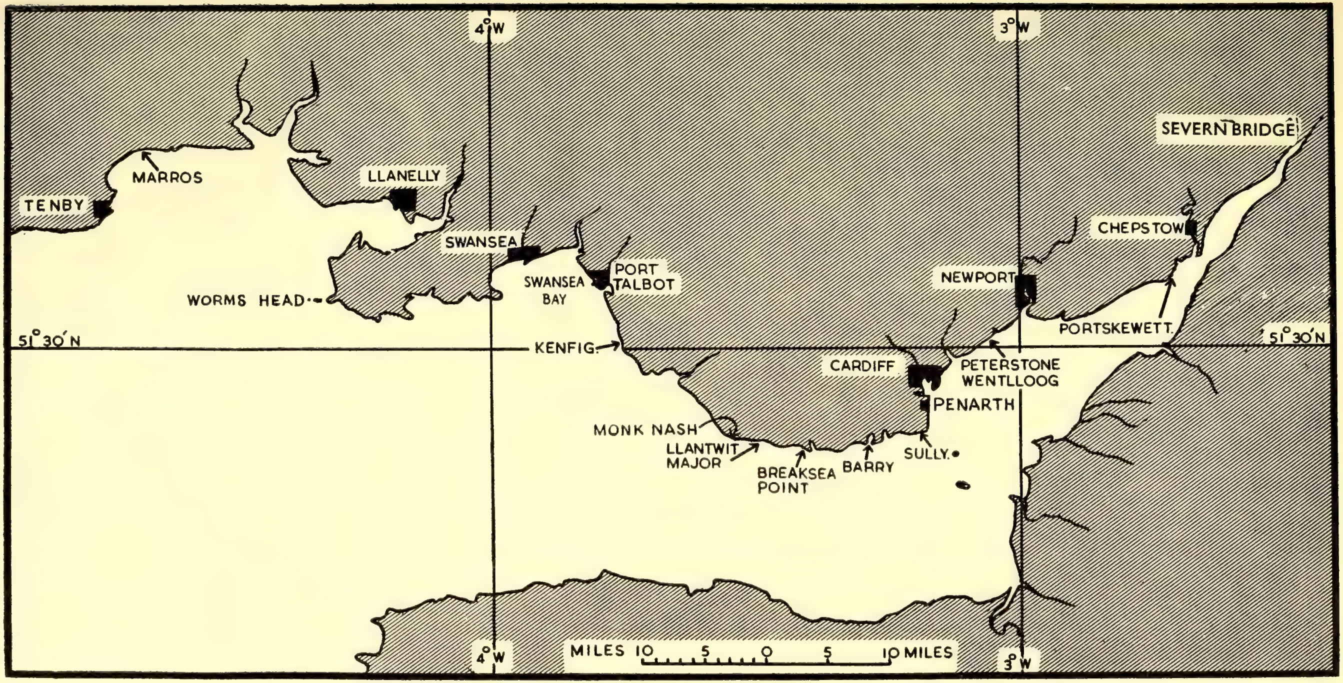
4° W
3° W
SEVERN BRIDGE
MARROS
LLANELLY
TENBY
CHEPSTOW
SWANSEA
PORT TALBOT
SWANSEA BAY
NEWPORT
WORMS HEAD
PORTSKEWETT
51° 30′ N
KENFIG
51° 30′ N
CARDIFF
PETERSTONE WENTLLOOG
PENARTH
MONK NASH
LLANTWIT MAJOR
SULLY
BREAKSEA POINT
BARRY
MILES 10 5 0 5 10 MILES
4° W
3° W

FIG. 1. MAP OF THE BRISTOL CHANNEL AND SEVERN ESTUARY SHOWING THE COLLECTING STATIONS ON THE NORTHERN SHORES.

Pier from May, 1948 till March, 1949. There was a slight seasonal change in salinity, but this was insignificant compared with sudden changes in salinity from week to week. These sudden fluctuations were probably due to the proximity of river mouths and local variations in rainfall.

Salinity at Penarth ranged from 20.5 to 28.0 °/oo. Rees (1939) recorded the salinity at high tide in Cardiff Roads at monthly intervals. His station would probably have been directly offshore from Penarth Pier, and his data are similar to those here recorded. Rees showed a distinct seasonal change from a minimum of 19.8 °/oo in January to a maximum of 28.0 °/oo in August.

Peterstone Wentlloog. Rees (1940) took samples from the shore and found the salinity to vary from 20.0 °/oo to 25.5 °/oo.

Severn Bridge. Water samples were taken at Low Water, Half Flood and at High Water, in April, June and September, 1948 and in January, 1949. Here there is a pronounced seasonal change in salinity, which ranged from 5 to 18 °/oo in the summer, but from 0 to 1.5 °/oo in the winter. Thus species living at any level on the beach in this area must be capable of a gradual seasonal acclimatisation of this order. A much more severe strain is placed on fixed organisms by the relatively rapid change in salinity from Low Water to High Water. As has been explained with lucidity by Bassindale (1943), the foot of the tidal wave is retarded in the upper reaches of the estuary, the duration of rise is reduced and the duration of fall is increased. The greatest rate of change of salinity is experienced during the rise of a Spring Tide, which is completed in 2 hours 53 minutes at Severn Bridge. Thus in a period of about 3 hours there may be a change of about 12 °/oo in salinity, i.e. a rate of change of 4 °/oo per hour. It must be remembered that such a change is only fully experienced by sedentary organisms occupying the lower part of the beach. Therefore in this zone of the estuary those species which are adapted to long exposure and life on the upper half of the beach will be able to extend their range further up the shores of the estuary than those which are not so adapted, and are obliged to occupy the lower part of the beach, unless the latter are markedly euryhaline.

In Fig. 2 the maxima and minima for the above six stations are plotted. It will be seen that as one passes up the Bristol Channel there is a steady fall in the average salinity which is accompanied by a steady rise in the total range of variation. When the range of variation in salinity is expressed as the percentage change at that station, as shown in the graph, the severity of these changes in the upper reaches of the Channel and the mouth of the Severn is emphasised.

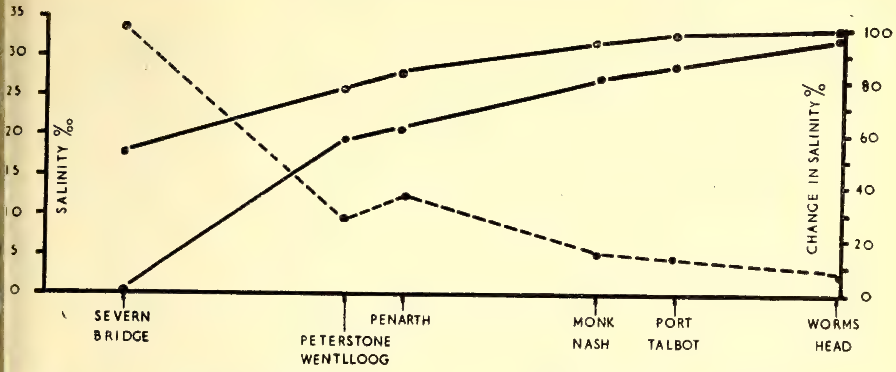

FIG. 2. GRAPHIC REPRESENTATION OF THE MAXIMUM SALINITY AND MINIMUM SALINITY RECORDED IN ONE YEAR AT A SERIES OF COLLECTING STATIONS ON THE NORTHERN SHORES OF THE BRISTOL CHANNEL AND SEVERN ESTUARY. THE BROKEN LINE SHOWS THE SAME DATA IN TERMS OF THE PERCENTAGE CHANGE IN SALINITY AT EACH STATION

PORTSKEWETT

The beach at Portskewett lies a little further up the estuary than that of Portishead on the opposite shore, and in general one would expect to find a close resemblance between the faunas of these two beaches. Since Portskewett is a considerable distance from University College, Cardiff, it was only possible to visit this beach once, with a group of three Honours Students, on October 21, 1949. Many species which one would expect to find at Portskewett, by comparison with Portishead, will not have been recorded due to the impossibility of making a comparably exhaustive survey.

The uppermost zone on the beach, above high water of neap tides, consisted of stretches of muddy gravel, occasional boulders and shallow pools. *Pelvetia canaliculata* and *Fucus spiralis* were poorly developed. From H.W.N.T. to about L.W.N.T., the beach consisted of very large immovable boulders and pockets of stiff mud. Above mean sea level the predominant alga was *Ascophyllum nodosum*, the fronds of which were of great length, while below, *Fucus serratus* predominated. From L.W.N.T. to L.W.S.T. the rocks were flat and bare, with occasional shallow pools. This zone, which is subjected to very powerful currents towards low tide, will experience a very considerable change in salinity in a period of less than 6 hours. The absence of *Sabellaria alveolata* (only very poorly developed at Portishead, Purchon, 1937), the rarity of *Nymphon ? gracile* and the poor development of *Sertularia cupressina* are probably due to the strong water currents on this part of the beach during the later part of the ebb tide.

The most remarkable feature of the beach at Portskewett was the distribution of *Littorina rudis*. This species was relatively small and rare on the upper half of the beach. Unusually large specimens were common on the bare rocks below L.W.N.T. where there was no apparent source of food, and where they were subjected to powerful water currents. Yonge (1949) indicates the normal vertical distribution of this species on the sea-shore (P. 197, Fig. 60) to which this forms a striking and possibly unique exception.

Fauna List at Portskewett

- CŒLENTERATA
  - Hydrozoa
    - *Tubularia indivisa* L.
    - *Sertularia cupressina* (L.)
  - Anthozoa
    - *Tealia felina* (L.)

- NEMERTINI
  - *Lineus gesserensis* O. F. Müller

- ANNELIDA
  - Polychaeta
    - *Nereis diversicolor* O. F. Müller
    - *N. virens* Sars
    - *Amphitrite johnstoni* Malmgren

- ARTHROPODA
  - Crustacea
    - Cirripedia
      - *Balanus improvisus* Darwin
    - Malacostraca
      - *Isopoda*
        - *Sphaeroma serratum* (Fabricius)
        - *Ligia oceanica* L.
        - *Idotea balthica* (Pallas)
      - *Amphipoda*
        - *Gammarus zaddachi* Sexton, var. *salinus*
        - *Marinogammarus marinus* (Leach)
        - *Orchestia mediterranea* A. Costa
        - *Talitrus saltator* (Montagu)
      - *Decapoda*
        - *Crangon vulgaris* L.
        - *Carcinus maenas* (Pennant)
  - Pycnogonida
    - *Nymphon* ? *gracile* Leach
  - Insecta
    - *Petrobius* sp
    - *Lipura maritima* Guérin

- MOLLUSCA
  - Placophora
    - *Lepidochiton cinereus* (L.)
  - Gastropoda
    - *Littorina rudis* (Maton)
    - *L. littoralis* (L.)
    - *Hydrobia ulvae* (Pennant)
    - *Patella vulgata* L.
    - *Adalaria proxima* Alder & Hancock

- POLYZOA
  - Ectoprocta
    - *Electra hastingsae* Marcus
    - *Callopora aurita* (Hincks)

- VERTEBRATA
  - Pisces
    - *Anguilla vulgaris* Turton
    - *Gobius minutus* Pallas

LLANTWIT MAJOR

The shore at Llantwit Major was visited once during 1948 and once during 1949, with parties of Honours Students. The uppermost part of the beach was occupied by a shingle bank, through which a large stream trickled. Below the shingle, the beach was very exposed, and consisted of broad flat sheets of rock and small boulders. The rock surface and the boulders were rather smooth and lacked crevices, the growth of large species of alga was weak, and the stream spread widely over the area, depressing the salinity. All these factors made for an impoverished intertidal fauna. Undoubtedly, however, if the shore were studied exhaustively over a wider area, very many additions would be made to the fauna list here recorded.

At low water mark of spring tides the boulder zone was similar to that found at Breaksea Point (Purchon, 1947), but here there were no overhanging rock ledges nor any exposures of friable rocks in the crevices of which a rich fauna would be expected. A strip of sand extending down to low water mark was not examined in detail.

Altogether, 65 species have been recorded from the shore at Llantwit Major, 13 of which are new records for the northern shores of the Bristol Channel (* in the accompanying list) ; 9 of these new records are apparently new for both northern and southern shores of the Bristol Channel, *Kefersteinia cirrata* having been found at Blue Anchor and *Crisia eburnea* at Ilfracombe (Bassindale, 1941) (while *Crisia eburnea*, *Osilinus lineatus*, *Ophiothrix fragilis* occur at Porlock Weir (Bassindale, 1943).

Fauna List at Llantwit Major

PARAZOA
- *Halichondria panicea* (Pallas)
- *Hymeniacidon sanguinea* (Grant)

CŒLENTERATA
- Hydrozoa
  - *Tubularia indivisa* L.
  - *Dynamena pumila* (L.)
- Anthozoa
  - *Tealia felina* (L.)
  - *Actinia equina* L.
  - *Sagartia troglodytes* (Price)

PLATYHELMINTHES
- Turbellaria
  - *Leptoplana tremellaris* (O. F. Müller)

NEMERTINI
- *Lineus gesserensis* O. F. Müller
- *Amphiporus lactifloreus* (Johnston)

ANNELIDA
- Polychaeta
  - **Eulalia viridis* (O. F. Müller)
  - **Nereis irrorata* (Malmgren)
  - **Perinereis cultrifera* (Grube)
  - **Nephthys caeca* (O. F. Müller)
  - *Nerine cirratulus* (Della Chiaje)
  - **Kefersteinia cirrata* (Keferstein)
  - *Pomatoceros triqueter* (L.)
  - *Apomatus similis* Marion & Bobretzsky
  - **Lanice conchilega* (Pallas)
  - *Sabellaria alveolata* (L.)
- Archiannelida
  - *Dinophilus* sp.

ARTHROPODA
- Crustacea
  - Cirripedia
    - *Balanus improvisus* Darwin
    - *B. balanoides* (L.)
    - *B. perforatus* Bruguière
    - *Chthamalus stellatus* (Poli)
    - *Verruca stroemia* (O. F. Müller)
- Malacostraca
  - *Isopoda*
    - *Jaera marina* (Fabricius)
    - **Idotea balthica* (Pallas)
    - *Ligia oceanica* (L.)
  - *Amphipoda*
    - *Marinogammarus marinus* (Leach)
    - *Orchestia gammarella* (Pallas)
  - *Decapoda*
    - *Leander serratus* (Pennant)
    - *Porcellana platycheles* (Pennant)
    - *P. longicornis* (L.)
    - *Carcinus maenas* (Pennant)
    - *Cancer pagurus* L.
    - *Eupagurus bernhardus* (L.)

MOLLUSCA
- Placophora
  - *Lepidochiton cinereus* (L.)
  - **Acanthochitona crinitus* (Pennant)
- Gastropoda
  - *Patella vulgata* L.
  - **Emarginula fissura* (L.)
  - *Gibbula cineraria* (L.)

G. umbilicalis (da Costa)
**Osilinus lineatus* (da Costa)
Littorina rudis (Maton)
L. littorea (L.)
Ocenebra erinacea (L.)
Nucella lapillus (L.)
**Cratena aurantia* (Alder & Hancock)
Adalaria proxima Alder & Hancock
Lamellibranchia
Mytilus edulis L.
Heteranomia squamula (L.)
Hiatella arctica (L.)

POLYZOA
Ectoprocta
Electra hastingsae Marcus
Callopora aurita (Hincks)
Berenicia patina (Lamk.)
Membranipora pilosa (L.)
**Crisia eburnea* (L.)
Alcyonidium polyoum (Hass.)

ECHINODERMATA
Asteroidea
Solaster papposus (L.)
Henricia sanguinolenta (O. F. Müller)
Ophiuroidea
Amphipholis squamata (Delle Chiaje)
**Ophiothrix fragilis* (Abildgaard)

VERTEBRATA
Pisces
Anguilla vulgaris Turton
Blennius pholis L.

KENFIG

Kenfig was chosen as a collecting station in preference to Porthcawl, although it was less easily reached, because of the presence there of an interesting reef which is only exposed at low tide. This beach was visited once, in March 1950, with a small party of Honours Students and also on other occasions before and after the war.

The shore at Kenfig consists of a very fine sweep of sand which slopes gently down to low water mark and which is exposed to very heavy seas in rough weather. At Sker Point on the east there is an impressive rocky promontory which is exposed to very heavy weather. (It was here that the Mumbles Lifeboat met its tragic fate.) Rich growths of algae are to be found in the rock pools, and lobsters can be caught, with skill, from the deep crevices in the sides of the pools. Moveable boulders are rare and the rock is exceedingly hard, smooth, and lacking in crevices. Collecting on Sker rocks is largely limited to fishing the rock pools with nets, and scraping the overhanging rock surfaces for sponges, polyzoa, ascidians, dorids, etc.

In places the rock was bored by large specimens of *Hiatella arctica*, which was recognised by the characteristic pink tips of the siphons, but which could not be broken out of the rock. Towards low water mark of spring tides there were very fine growths of the reef sand-worm, *Sabellaria alveolata*. This species is convenient for the conduction of artificial fertilisations in the laboratory, for ripe specimens can be obtained at all seasons.

The sands are too greatly exposed to heavy seas to possess anything but a greatly impoverished infauna, and no attempt was made to collect from the sand.

The reef which is only exposed at low tide lies a fe yards to the west of Sker Point, and consists of a more friable rock, with shallow pools, overhanging ledges and small crevices. There are plenty of heavy boulders, which can just be turned over. Algae are rare, and the reef is very bare in appearance, but it proved to be a good collecting area.

Alcyonium digitatum is not commonly found intertidally (the writer has only found this species intertidally at Bangor, North Wales), but small colonies were common on the reef on the under sides of overhanging ledges. Remarkably large specimens of *Nucella lapillus* were found on the reef but not elsewhere. They may presumably be identified as *N. lapillus* var. *major*, which was described by Jeffries (1867) as occurring in deep water in this area. Other striking additions here were *Octopus vulgaris*, *Ostrea edulis* (one specimen each) and *Homarus vulgaris*, *Pilumnus hirtellus*, *Ophiothrix fragilis*, and *Cratena glotensis* which was common.

Altogether 24 species new to the northern shores of the Bristol Channel (* in the accompanying list) have been recorded at Kenfig, and of these the majority are new records for the Bristol Channel as a whole. *Anomia ephippium* and *Ostrea edulis* have been recorded from Blue Anchor, and *Sycon* sp., *Alcyonium digitatum*, *Bunodactis verrucosa*, and *Flustra papyracea* from Ilfracombe (Bassindale, 1941).

Judging by the fauna list, one would probably regard Kenfig as a fully marine station. It is interesting to note that even at this station the Laminarian zone is not colonised by large seaweeds, but chiefly by *Sabellaria*. The environmental factor which excludes *Laminaria* and *Saccorhiza* from this station, and from all collecting stations further up the Bristol Channel, is not known.

Fauna List at Kenfig

PARAZOA
- *Halichondria panicea* (Pallas)
- *Chalina oculata* (Pallas)
- *Grantia compressa* (Fabricius)
- *Hymeniacidon sanguinea* (Grant)
- * *Terpios fugax* Duchassaing & Michalotti
- **Sycon* sp.

CŒLENTERATA
- HYDROZOA
  - *Tubularia indivisa* L.
  - *Hydrallmania falcata* (L.)
  - *Sertularia cupressina* (L.)
  - *Dynamena pumila* (L.)
  - **Sertularia operculata* L.
- ANTHOZOA
  - Alcyonaria
    - **Alcyonium digitatum* L.
  - Actiniaria
    - *Tealia felina* (L.)
    - *Actinia equina* L.
    - *Sagartia elegans* (Dalyell)
    - **Metridium senile* (L.)
    - **Bunodactis verrucosa* (Pennant)

ANNELIDA
- POLYCHAETA
  - *Lagisca extenuata* (Grube)
  - **Sthenelais boa* (Johnston)
  - *Phyllodoce maculata* (L.)
  - *Eulalia viridis* (O. F. Müller)
  - *Kefersteinia cirrata* (Keferstein)
  - **Pterosyllis formosa* Claparède
  - *Perinereis cultrifera* (Grube)
  - *Marphysa sanguinea* (Montagu)
  - *Polydora ciliata* (Johnston)
  - *Arenicola marina* L.
  - *Sabellaria alveolata* (L.)
  - *Lanice conchilega* (Pallas)
  - *Terebella lapidaria* L.
  - * *Thelepus setosus* (Quatrefages)

Potamilla reniformis (O. F. Müller)
Pomatoceros triqueter (L.)
Archiannelida
Dinophilus sp.
Gephyrea
Phascolosoma minutum Keferstein
ARTHROPODA
Crustacea
Cirripedia
Balanus improvisus Darwin
B. balanoides (L.)
B. perforatus Bruguière
B. crenatus Bruguière
Chthamalus stellatus (Poli)
Malacostraca
Isopoda
Ligia oceanica (L.)
**Eurydice pulchra* Leach
Amphipoda
**Caprella ? hirsutum*
Decapoda
Crangon vulgaris L.
**Homarus vulgaris* Milne Edwards
Porcellana platycheles (Pennant)
P. longicornis (L.)
Eupagurus bernhardus (L.)
Carcinus maenas (Pennant)
Cancer pagurus L.
**Pilumnus hirtellus* (L.)
Pycnogonida
Nymphon ? gracile Leach
Pycnogonum littorale (Stroem)
**Ammothea echinata* (Hodge)
Insecta
Petrobius sp.
Lipura maritima Guérin
MOLLUSCA
Placophora
Lepidochiton cinereus (L.)
Gastropoda
Patella vulgata L.
Gibbula cineraria (L.)
Osilinus lineatus (da Costa)
Littorina littoralis (L.)
L. neritoides (L.)
L. rudis (Maton)
L. littorea (L.)
Buccinum undatum L.
Ocenebra erinacea (L.)
Nucella lapillus (L.)
**N. lapillus* var. *major*
**Cratena glotensis* (Alder & Hancock)
Ancula cristata (Alder)
Acanthodoris pilosa (Abildgaard)
Lamellibranchia
**Anomia ephippium* L.
Mytilus edulis L.
**Ostrea edulis* L.
Paphia saxatilis (Fleurian)
Hiatella arctica (L.)
Cephalopoda
**Octopus vulgaris* Lamarck
POLYZOA
Ectoprocta
Electra hastingsae Marcus
E. pilosa (L.)
**Flustra foliacea* (L.)
**F. papyracea* Ellis & Solander
**Membranipora membranacea* (L.)
Cryptosula pallasiana (Moll)
Crisia eburnea (L.)
ECHINODERMATA
**Asterias rubens* L.
Ophiothrix fragilis (Abildgaard)
Amphipholis squamata (Delle Chiaje)
**Psammechinus miliaris* (Gmelin)

SUBLITTORAL FAUNA OF SWANSEA BAY

In September, 1948 the writer and Mr. G. D. Waugh visited The Mumbles, Swansea, in order to carry out trawling and dredging operations offshore with Mr. Garner, Coxswain of the new Mumbles Lifeboat. Living expenses precluded a long stay at the Mumbles and Mr. Garner's duties with the Lifeboat limited the time available for collecting.

The oyster grounds (Cock Beds, Roads Haul and White Oyster Ledge) were found to be in a derelict condition. A very few old oysters were collected, with their shells riddled by *Cliona* and other boring organisms. No young oysters were found in any dredge haul. Cole (1949) reported that it would not be practicable to re-stock these beds.

Trawl hauls were taken in various parts of Swansea Bay, and a variety of bottom-living fish was obtained. In one haul, off Port Talbot, the trawl was white with the Tectibranch *Philine aperta*, and empty shells of *Spisula* sp. were also taken in the net. The great abundance of *Philine* in this area must do a great deal of damage to the small bivalves which form the basic food of some of the flatfish in this area.

The following list includes the more interesting of the species recorded in Swansea Bay in September 1948. Fifteen of these are new records for the Northern Shores of the Bristol Channel (* in accompanying list).

PARAZOA
    **Cliona celata* Grant

ANNELIDA
  Polychaeta, Errantia
    **Nereis fucata* Savigny

ARTHROPODA
  Crustacea, Decapoda
    **Portunus puber* (L.)
    **Macropodia rostratus* (L.)
MOLLUSCA
  Gastropoda
    **Philine aperta* (L.)
  Lamellibranchia
    Anomia ephippium L.
    Ostrea edulis L.

ECHINODERMATA
  Ophiuroidea
    **Ophiura texturata* Lamarck

VERTEBRATA
  Pisces
    **Scyllium canicula* (L.)
    **Rhina squatina* (L.)
    **Raja clavata* L.
    **Callionymus lyra* L.
    **Pleuronectes flesus* L.
    **P. platessa* L.
    P. limanda L.
    **Rhombus laevis* (Rondelet)
    **Solea vulgaris* Quensel
    **Trigla cuculus* L.
    Agonus cataphractus (L.)

MARROS

Marros, Carmarthenshire, is a very inaccessible beach a few miles west of Pendine. This beach was not specially selected as a collecting station, but the opportunity was taken to make observations and a small collection, while the writer stayed in a small cottage close to the shore in this region in the summers of 1945 and 1949.

Altogether 50 species have been recorded from the shore at Marros and the rocky headlands of Talpin Point on the west and Ragwen Point on the east. This must be a very small proportion of the potential fauna between Pendine on the east and Tenby on the west. Nevertheless some 15 of these are new records for the northern shores of the Bristol Channel (* in the accompanying list). Nine of these are new records for the whole Bristol Channel.

The shores in the vicinity of Marros are notable for two associations :—the sandy shore, and the exposures of peat (submerged forest of Amroth).

In the sand a variety of lamellibranchs are found, of which the most conspicuous is *Donax vittatus*. The posterior end of the shell commonly lies close to the surface of the sand, and its position in the sand is marked by a large epiphytic growth of *Laomedea flexuosa*. This species of bivalve is a source of food to Herring Gulls which are doubtless assisted in their search by the epiphytic tufts. One can often obtain a good sample of living *Donax* by disturbing the gulls after they have been feeding, when they may disgorge several intact specimens as well as shell fragments from their crops.

Typical sand dwelling carnivores such as the gastropods *Natica* and *Actaeon*, and the asteroid *Astropecten* are not uncommon, and can best be found by examining disturbances in the surface of the sand while the tide is beginning to rise. Nearly all the specimens of *Astropecten irregularis* carried a commencal specimen of the polychaet *Acholoë astericola*.

Between Marros and Amroth there are extensive exposures of peat in which small branches are embedded. In places this layer has been eroded to form pools which have a sand bottom, are shallow on the landward side and quite deep on the seaward side. The peat rims of these pools are undercut, and can be broken away easily. These rims are extensively bored by *Barnea candida* and, more rarely, by *B. parva*. In the summer of 1949 *Idotea linearis* was very common in these pools. These made themselves conspicuous by swimming quite strongly up to the surface and then, arching the body and extending all the limbs, sinking slowly out of sight again. The significance of the action is not apparent.

Fauna List at Marros

PARAZOA
- *Halichondria panicea* (Pallas)

CŒLENTERATA
- HYDROZOA
  - **Laomedea flexuosa* Hincks
  - *Sertularia cupressina* (L.)
- ANTHOZOA
  - *Actinia equina* L.
  - **Anemonia sulcata* (Pennant)
  - *Tealia felina* (L.)
- CTENOPHORA
  - *Pleurobrachia pileus* (O. F. Müller)

NEMERTINI
- *Lineus ? gesserensis* O. F. Müller

ANNELIDA
- POLYCHAETA
  - *Eulalia viridis* (O. F. Müller)
  - **Acholoë astericola* (Delle Chiaje)
  - **Nephthys hombergi* Lamarck
  - **Owenia fusiformis* (Delle Chiaje)
  - *Sabellaria alveolata* (L.)
  - *Arenicola marina* L.
  - *Lanice conchilega* (Pallas)

ARTHROPODA
- CRUSTACEA
  - Cirripedia
    - *Balanus balanoides* (L.)
    - *Chthamalus stellatus* (Poli)
    - **Lepas anatifera* L.
- MALACOSTRACA
  - *Isopoda*
    - **Tanais cavolini* Milne-Edwards
    - *Sphaeroma serratum* (Fabricius)
    - *Jaera marina* (Fabricius)
    - *Ligia oceanica* (L.)
    - **Idotea linearis* (L.)
  - *Amphipoda*
    - *Corophium volutator* (Pallas)

- *Decapoda*
  - *Leander serratus* (Pennant)
  - *Crangon vulgaris* L.
  - *Carcinus maenas* (Pennant)
  - **Portumnus latipes* (Pennant)
  - *Cancer pagurus* L.
- INSECTA
  - *Petrobius* sp.
  - *Lipura maritima* Guérin

MOLLUSCA

- PLACOPHORA
  - *Lepidochiton cinereus* (L.)
- GASTROPODA
  - *Patella vulgata* L.
  - *Gibbula umbilicalis* (da Costa)
  - *Osilinus lineatus* (da Costa)
  - *Littorina neritoides* (L.)
  - *Littorina rudis* (Maton)
  - *L. littorea* (L.)
  - **Natica catena* (da Costa)
  - *Nucella lapillus* (L.)
  - **Acteon tornatilis* (L.)
- LAMELLIBRANCHIA
  - *Mytilus edulis* L.
  - **Donax vittatus* (da Costa)
  - **Mactra corallina* (L.)
  - **Chione striatula* (da Costa)
  - *Paphia pullastra* (Montagu)
  - *Barnea parva* (Pennant)
  - *B. candida* (L.)

POLYZOA

- ECTOPROCTA
  - *Cryptosula pallasiana* (Moll)

ECHINODERMATA

- ASTEROIDEA
  - **Astropecten irregularis* (Pennant)

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THE DALE FORT MARINE FAUNA

By R. BASSINDALE and J. H. BARRETT

INTRODUCTION

THE Field Centre was established at Dale Fort in Pembrokeshire on the south-west tip of Wales in the summer of 1947. A list of 153 species of seaweeds occurring in the area has already been published (Thomas, E. M., "A preliminary list of marine algae of south-west Pembrokeshire", *North Western Naturalist*, XXIV, Dec. 1953, 568–579). A preliminary typed list of the Dale marine fauna is replaced by the present list which is itself by no means complete. Much remains to be done and we hope workers will be stimulated to fill in the gaps and to record their finds in the Centre's index.

Acknowledgments to the contributors of records from which the list is compiled are given at the head of the list. We should like to express our thanks here to Miss Barbara Dresser for the three figures drawn to our particular requirements, and to the Leverhulme Trustees for financial assistance in publication.

ACCOUNT OF THE AREA

TIDES

A good account of tides and waves is to be found in Pilkington (*The Ways of the Sea*, Routledge and Kegan Paul, 1957).

The following tidal data for the Dale area, which are useful to shore collectors, are expressed in feet and decimals of a foot above "chart datum". Only very exceptional tides ebb below this level.

Level	Abbreviation	Pembroke Dock Feet above chart datum	St. Ann's Head Feet above chart datum
Mean high water of spring tides ..	MHWS	22·33	21·63
Mean high water of neap tides ..	MHWN	16·97	16·47
Mean tide level	MTL	12·20	12·20
Mean low water of neap tides ..	MLWN	7·54	7·54
Mean low water of spring tides ..	MLWS	1·89	1·69

In Milford Haven, therefore, the lowest tides ever experienced (LWEST) go down to a little below zero (chart datum) but on the average spring tide low water is nearly two feet above this. Under normal conditions in this area, the range of a spring tide is nearly 20 feet, and of a neap tide nearly 9 feet.

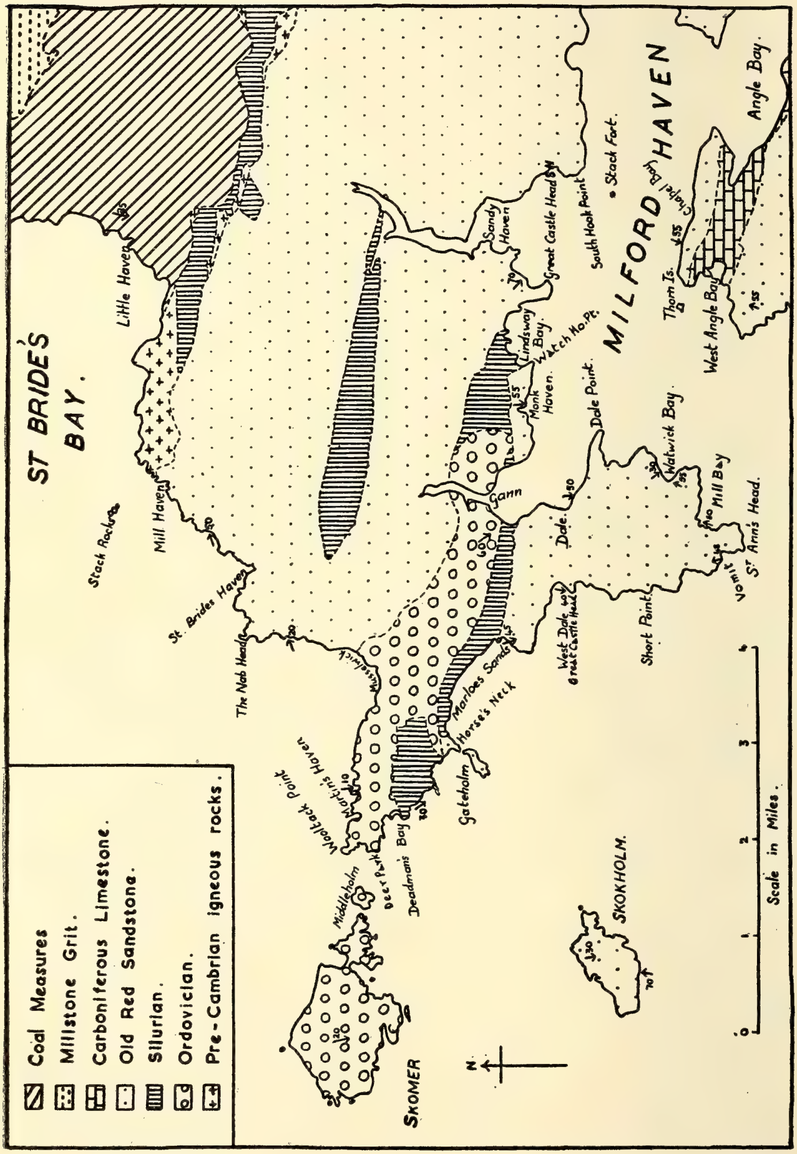
ST BRIDE'S BAY.
MILFORD HAVEN
Little Haven
Mill Haven
Stack Rocks
St. Brides Haven
The Nab Head
Musselwick
Martin's Haven
Wooltack Point
Deer Park
Deadman's Bay
Middleholm
SKOMER
Gateholm
Horse's Neck
Marloes Sands
West Dale Bay
Great Castle Head
Dale
Gann
Monk Haven
Lindsway Bay
Watch Ho. Pt.
Dale Point
Sandy Haven
Great Castle Head
South Hook Point
Stack Fort
Chapel Bay
Thorn Is.
West Angle Bay
Angle Bay
Watwick Bay
Mill Bay
St. Ann's Head
Vomit
Short Point
SKOKHOLM
N.
0
1
2
3
4
Scale in Miles.
▨ Coal Measures
▦ Millstone Grit.
▤ Carboniferous Limestone.
⋯ Old Red Sandstone.
▥ Silurian.
○ Ordovician.
+ Pre-Cambrian igneous rocks.

FIG. I. MAP OF THE GENERAL AREA AROUND DALE FORT SHOWING THE GEOLOGY

It is a feature of the tidal cycle that at any particular place, tides of a given range usually occur about the same time of day, thus at Dale low water at spring tides occurs at about 1.30 a.m. and 1.30 p.m. (G.M.T.) i.e. good collecting tides occur about mid-day: whereas neap tide low waters are at about 7.0 a.m. and 7.0 p.m, and the high tide covers the shore at mid-day.

Superimposed on the normal, predictable tide levels is a variation due to wind. This effect is particularly noticeable in places like Milford Haven. A 'following' wind—a south westerly—blowing strongly on the flood tide, may cause the actual tide to rise in the Haven by as much as 2 feet above the predicted level and the same wind will hold the water in the Haven and prevent it ebbing to the predicted low level. Conversely a north east gale will help the water out of the Haven and cause it to ebb lower than the predicted level and thus to expose more shore than expected. It may also affect the actual time of the turn of tide by minutes or even by half an hour.

THE CLIMATE

The parish of Dale is at the extreme tip of the SW peninsula of Wales, and is almost surrounded by the sea. Inevitably its westerly situation and the shape of the coast combine to moderate both winter and summer temperatures and to maintain a high relative humidity. The parish is too far west for the rainfall to be influenced by the Welsh uplands; the intersection of the Bristol and St. George's Channels is one of the windiest areas in Britain. The profound effect of wind on the vegetation is clearly marked. The exposed Atlantic cliffs show considerable differences from the sheltered slopes at the edge of Milford Haven.

		J	F	M	A	M	J	J	A	S	O	N	D
Temperature													
Mean max. °F.	St. Ann's 1921–35	47	46	48	51	55	61	63	63	60	56	51	48
	Dale Fort 1950–56	49	45	48	52	57	62	65	65	62	58	51	49
Mean min. °F.	St. Ann's 1921–35	42	40	40	42	47	51	55	55	53	49	45	43
	Dale Fort 1950–56	39	36	40	42	47	52	55	56	54	49	45	43
Rainfall													
Av. fall in mms.	St. Ann's 1881–1915	84	70	66	48	48	51	63	79	69	107	96	114
	Dale Fort 1950–56	71	69	64	45	53	55	48	79	73	63	85	93
Relative Humidity													
Av. %	Dale Fort 1950–56	87	84	85	82	82	84	82	85	83	84	85	85

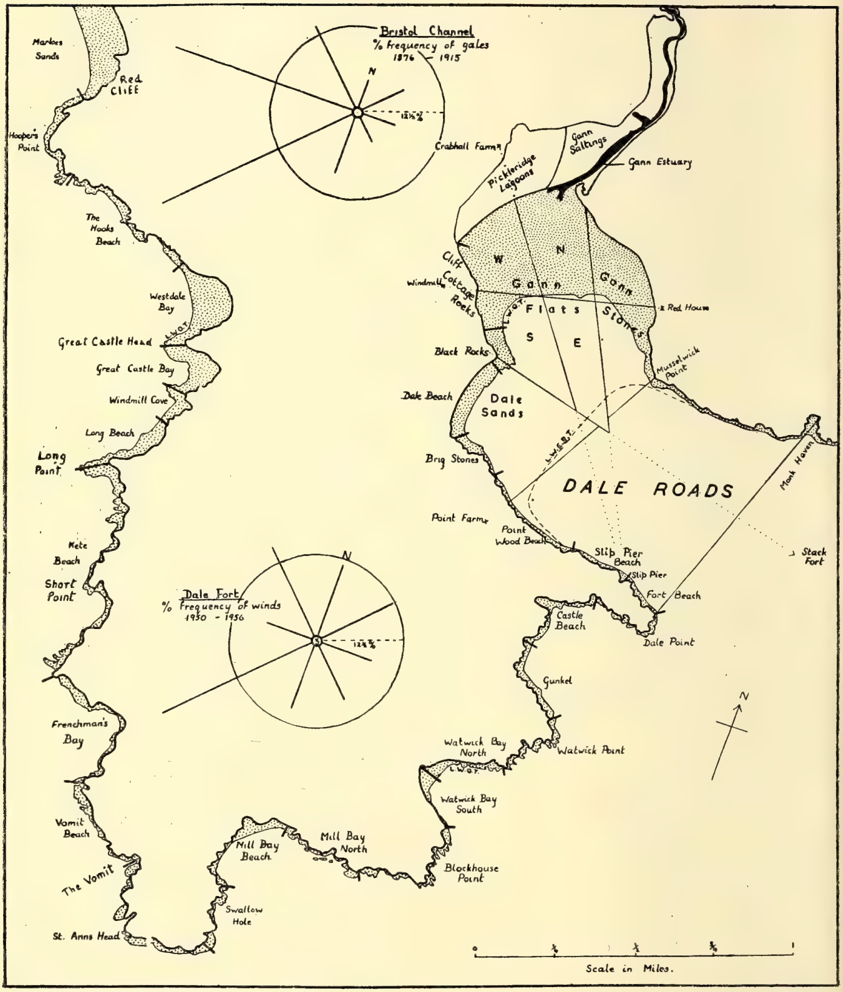
Marloes Sands
Red Cliff
Hooper's Point
The Hooks Beach
Westdale Bay
L.W.O.T.
Great Castle Head
Great Castle Bay
Windmill Cove
Long Beach
Long Point
Kete Beach
Short Point
Frenchman's Bay
Vomit Beach
The Vomit
St. Anns Head
Swallow Hole
Mill Bay Beach
Mill Bay North
Blockhouse Point
Watwick Bay South
L.W.O.T.
Watwick Bay North
Watwick Point
Gunkel
Castle Beach
Dale Point
Fort Beach
Slip Pier
Slip Pier Beach
Point Wood Beach
Point Farm
Brig Stones
Dale Sands
Dale Beach
Black Rocks
Cliff Cottage Rocks
Windmill
L.W.O.T.
W
N
S
E
Gann Flats
Gann Stones
Red House
Musselwick Point
Pickleridge Lagoons
Gann Saltings
Gann Estuary
Crabhall Farm
Bristol Channel
% frequency of gales
1876 – 1915
N
12½%
Dale Fort
% frequency of winds
1950 – 1956
N
12½%
L.W.S.B.T.
DALE ROADS
Monk Haven
Stack Fort
N
0
¼
½
¾
1
Scale in Miles.

FIG. 2. MAP OF THE DALE PENINSULA SHOWING THE NAMED COLLECTING BEACHES

Sunshine

		J	F	M	A	M	J	J	A	S	O	N	D
Hrs./day	St. Ann's	1·7	2·6	4·1	5·7	6·4	7·2	6·6	5·7	4·7	3·1	2·2	1·5
% of poss.	1906–35	20	27	35	41	41	44	41	39	38	29	25	19
Hrs./day	Dale Fort	2·1	3·6	5·2	6·7	7·8	6·5	6·7	6·4	5·5	3·3	2·3	1·6
% of poss.	1952–56	26	37	44	48	50	38	42	44	44	31	27	21

Wind

Av. no. of gales 1876–1915												
St. George's Ch.	4·6	3·6	3·4	1·4	0·8	0·4	0·4	1·0	1·5	3·5	4·5	5·3
Bristol Ch.	5·2	4·7	3·6	2·0	0·9	0·7	0·7	1·7	2·1	4·4	5·2	6·3

% frequency in year from	N	NE	E	SE	S	SW	W	NW	calm
St. Ann's 1935–43	10	11	10	9	9	15	18	16	2
Dale Fort 1950–56	11	11	8	9	10	25	7	15	3
Bristol Ch. gales 1876–1915	4	7	5	4	9	32	28	14	

Diagrams of the direction of the wind at Dale and of gales in the Bristol Channel are presented on Fig. 2.

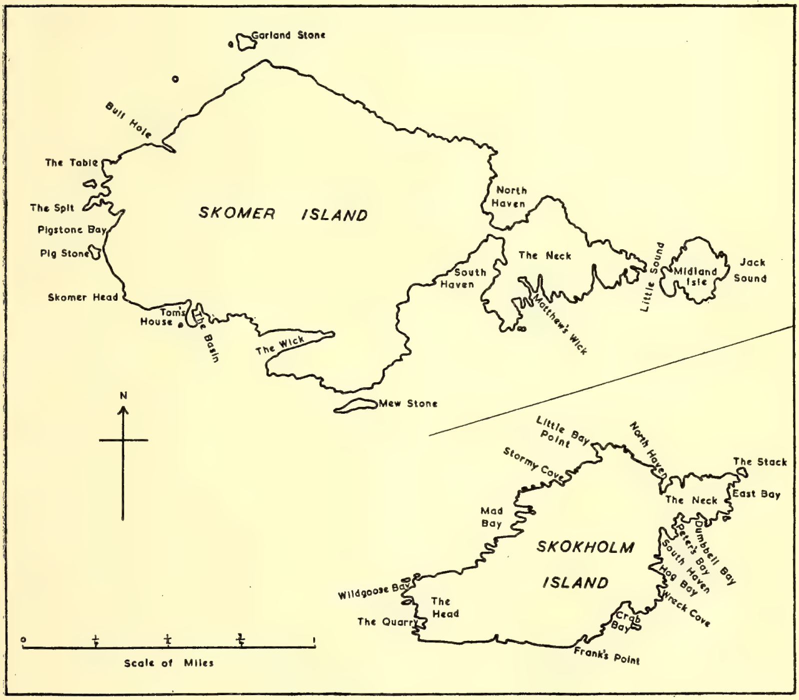
Garland Stone
Bull Hole
The Table
The Spit
Pigstone Bay
Pig Stone
Skomer Head
Tom's House
The Basin
The Wick
SKOMER ISLAND
North Haven
South Haven
The Neck
Matthew's Wick
Little Sound
Midland Isle
Jack Sound
Mew Stone
N
Little Bay Point
Stormy Cove
North Haven
The Stack
The Neck
East Bay
Mad Bay
SKOKHOLM ISLAND
Peter's Bay
Dumbbell Bay
South Haven
Hog Bay
Wreck Cove
Wildgoose Bay
The Head
The Quarry
Crab Bay
Frank's Point
0
¼
½
¾
1
Scale of Miles

FIG. 3. MAP OF SKOKHOLM AND SKOMER ISLANDS

THE GEOLOGY OF THE COLLECTING AREA

The beautiful coastline of Pembrokeshire is entirely of the older rocks. Much of the geology is extremely complicated; some has not yet been adequately described.

The parish of Dale is almost entirely of the Red Marls of the Lower Old Red Sandstone. The peninsula south of the valley in which the village is sited is a large syncline with the axis pitching from the Short Point through Watwick Bay eastwards across the harbour to West Angle Bay. At West Dale and Dale Point the dip is 40° and between 50° and 60° to the south respectively; by the Vomit and in Mill Bay it is 48° NNW and 80° NNE respectively. On the north side of Watwick Bay it is 30° to the SE and on the south side of the bay it is 55° to the NNE.

Reappearing in West Angle Bay the axis of the syncline runs ESE in Carboniferous Limestone, with the Upper Old Red Sandstone dipping into the valley from either side.

The Dale valley is probably based on a large fault of the Ritec system. Its line continues the length of Milford Haven. The valley is floored by superficial deposits of boulder clay and head associated with the retreat stage of the Irish Sea Ice (Groom, G. E., The Development of the Dale Valley. *Field Studies Council Annual Report*, 1955–56). Southerly-hading faults, with wide shatter belts, are visible in the cliff sections for some distance on either side of West Dale Bay.

The Red Marls continue northwards, dipping 45° SSE, to the conformable junction with the Ludlow Sandstones of the Silurian which runs eastwards from Red Cliff to the Pickleridge limekiln. Across the Gann, except for Lindsway Bay, the Red Marls make up the north coast of the Haven for several miles; the section Musselwick Point—Monk Haven—Watch House Point cliffs dips 55° SSE. Still further east, on either side of Sandy Haven, multiple folding produces rapid changes of dip, although the strike continues roughly east and west. In Lindsway Bay the faulted complications of the local Silurian geology repeat the main features of Marloes Sands.

The Silurian cliffs of Marloes Sands show exposures of the Ludlow Sandstone, the Wenlock Coralliferous Limestone and the Upper Llandovery Conglomerates. These three series are divided by block faults which bring the various horizons into the same cliff sections. Angles of dip and strike change rapidly; varying hardnesses of contiguous horizons and the weakening of the rock structure by repeated folding and faulting has led to much irregularity in the rate of erosion, parts of the beach are of sand and shingle while other parts are of rock debris some of which rests directly on the wave-cut platform amongst stacks of a great range of shape and size.

Gateholm is the largest stack and protects the west flank of the bay. With the tip of the Horse's Neck on the mainland opposite, and like the Red Cliff on the eastern side of the bay, Gateholm is of Red Marls. From the Horse's Neck westwards, past the Rainy Rock to Deadman's Bay the cliff section is uniformly of massive Ludlow Sandstone, dipping 20°–45° SE. Further north-west the prolongation of the peninsula into the Deer Park and Wooltack Point is based on a narrow outcrop of Ordovician Volcanics of Arenig age (the Skomer Volcanic Series), of varying hardness and much faulted, producing continually differing coastal forms.

The northern coast of the Marloes peninsula runs east from Martin's Haven as a series of small rifts in the Ordovician Volcanics; at Musselwick Sands black Ordovician shales contrast with the Old Red Sandstone which carries the cliff on to Mill Haven, dipping inland all the way, small faults producing small inlets. A large intrusion of Pre-Cambrian dolerite separates Mill Bay from the Coal Measures of Little Haven and the whole base of St. Bride's Bay.

The complex pattern of the mainland structures is reflected in the off-shore islands. Skokholm is wholly of the Lower Old Red Sandstone, dipping to the south, except along its south coast where the dip is to about 70° to the north. Middleholm and Skomer are of Arenig lava flows (Skomer Volcanic Series) inter-bedded with some contemporary sediments. The islands dip about 20° slightly east of south; multiple faulting and differential erosion produces an irregular coast. Grassholm and The Smalls continue the Ordovician volcanics seawards.

The dominant feature of the whole topography is the 200 ft. erosion surface into which the drainage system is deeply incised. The cliffs are mostly almost vertical, and, outside St. Ann's Hd., only in bays is their foot readily accessible. Elsewhere fallen masses of rock lie amongst stacks in all stages of erosion down to the wave-cut platform which in some places is visible at low tide. Where it can be reached, e.g. on either side of West Dale and round Gateholm, this combination of beach material gives rich collecting. In the bays sand collects below a storm beach of shingle and only a small range of plants and animals survive. Where the tide never leaves the foot of the cliff, e.g. Wooltack Point and the islands, the surfaces are poorly populated but crack and crevice fauna is abundant.

Within St. Ann's Hd. the waters of Milford Haven are more or less sheltered from the prevailing winds and the cliffs tend to be less steep, with their foot more easily reached. Boulders of smaller size are left undisturbed by wave action. A wide range of plants and animals are to be found, particularly in Swallow

Hole, Gunkel and round the north-east corner of Great Castle Head.

The head of Dale Roads dries out at low water springs. The line of the Dale valley continues eastwards as a sandy substrate with some mud admixed. In contrast the Gann stream flows to the sea across a muddy-gravelly flat. These two habitats are very rich in burrowing forms and complement each other. The Gann stream completes all the gradations from fresh to salt in the mile and a half above its mouth, where it runs through a typical saltmarsh.

Little is known of the sub-littoral zone. Within Dale Roads the bottom is largely sandy, with increasing mud towards the south and stones to the north. Off Lindsway and off Stack Fort more small stones and clinker must litter the bottom. The Thorn and Chapel Rocks prevent dredging in the entrance to the harbour.

Outside St. Ann's what is known has been gleaned from lobster fishermen and the chart rather than by dredging. The bottom between the islands and the coast is of clean sand amongst which isolated and small groups of rocks occur.

Thus, from the collector's point of view, there is a wide selection of storm washed steep rocky shores with a limited fauna, except in crevices and amongst boulders, while in sheltered areas such as the rocky shores from Dale Point to Dale village and the Gann Stones there is an excellent fauna of typical rock shore forms.

The clean (and storm washed) sand beaches of Marloes Sands, West Dale Bay and Castle Beach carry few animals but in sheltered places where sand or shingle is mixed with mud, as at Dale Beach, the Gann Flats and parts of Angle Bay, there are extensive beds with numerous burrowing worms and lamellibranchs, and in Angle Bay (but not in Dale Bay) there are flats of soft mud inhabited by the more limited fauna of such situations.

THE FAUNA LIST

Acknowledgments and Explanation

The list of species has been compiled from the card index made by both permanent and temporary workers at the Field Centre. The following alphabetical list gives the initials, by which records in the list of species are acknowledged, the full names of the recorders, to whom our thanks are due, and the number of records they have made. Special mention should be made of the contribution of Professor R. D. Purchon who made the initial survey of the fauna and founded the card index.

LIST OF RECORDERS AND THE INITIALS BY WHICH THEY ARE ACKNOWLEDGED

Initials	Name	No. of records
A.D.	Mrs. Angela Davis	96
A.E.G.P.	Mr. Alan E. G. Pearson	1
A.F.B.	Mr. A. F. Baldry	2
A.K.C.	Mr. A. K. Cadbury	1
A.W.L.	Mr. A. W. Lloyd	1
B.I.R.	Dr. B. I. Roots	5
B.K.W.	Miss B. K. Whittaker	13
B.T.H.	Mr. B. T. Hepper	15
C.E.D.	Mr. C. E. Dyte	6
C.J.D.	Mr. C. J. Duncan	4
C.R.T.	Mr. C. R. Thorne	13
C.M.	Miss C. Mason	28
C.T.	Mr. C. Thomas	18
D.W.S.	Dr. D. W. Snow	57
E.A.G.	Brigadier E. A. Glennie	1
E.D.E.	Miss E. D. Eagle	1
E.C.J.	Mr. E. C. Judges	20
E.M.S.	Dr. E. M. Shepherd	31
E.M.T.	Miss E. M. Thomas	44
G.B.E.	Mr. G. B. Evans	1
G.C.B.	Mr. G. C. Bolster	1
G.D.W.	Dr. G. D. Waugh	1
G.E.B.	Mr. G. E. Barnes	3
G.O.	Mr. G. Owen	212
G.T.J.	Mr. G. T. Jefferson	50
H.A.C.	Dr. H. A. Cole	1
H.B.	Mr. H. Bowen	9
H.H.	Miss H. Horder	2
H.J.	Mr. H. Joules	3
H.P.M.	Professor H. P. Moon	100
H.J.M.B.	Mr. H. J. M. Bowen and Miss U. H. Williams	53
I.L.O.	Mr. I. L. Owen	1
J.G.	Mr. J. Green	38
J.G.B.	Miss J. G. Barker	1
J.H.B.	Mr. J. H. Barrett	429
J.M.	Mr. J. Moyse	30
J.P.	Mr. J. Pierson	11
J.S.C.	Mr. J. S. Cormack	5
K.D.	Mr. K. Dyke	1
K.G.M.	Mr. K. G. Messenger	19
K.S.T.	Untraced	30
M.B.G.G.H.	Dr. M. B. G. G. Haas	2
M.E.B.	Miss M. E. Bytheway	3
M.H.W.	Mr. M. H. Williamson	1
M.R.	Miss M. Roper	1

Initials	Name	No. of records
M.R.Y.	Dr. M. R. Young	112
M.W.	Mr. M. Walpole	5
N.A.H.	Dr. N. A. Holme	15
N.C.	Mr. N. Condor	1
N.N.G.B.	Mr. N. N. G. Bell	1
N.W.M.	Dr. N. W. Moore	194
O.R.B.	Dr. O. R. Barclay	13
P.A.	Miss P. Adams	1
P.C.C.C.	Mr. P. C. C. Chapman	1
P.di B.	Mr. P. di Brent	5
P.D.	Mr. P. Davis	1
P.S.	Mr. P. Seddon	1
P.J.C.	Mr. P. J. Conder	3
P.S.C.	Mrs. P. S. Crafter	1
R.C.	Mr. R. Clarke	1
R.D.P.	Professor R. D. Purchon	587
R.F.N.	Dr. R. F. Nash	2
R.G.	Mr. R. Goodier	4
R.H.B.	Mr. R. H. Baird	1
R.H.	Mr. R. Harkness	167
R.R.	Mr. R. Ralphs	1
T.B.	Mr. T. Bagenal	1
U.B.	University of Bristol (Parties led by Dr. N. W. Moore and Mr. R. Bassindale)	347
U.C.L.	University College, Leicester (Parties led by Professor H. P. Moon, Miss Moody, Miss G. C. Evans)	126
U.C.W.	University College of Wales, Cardiff (Parties led by Dr. E. M. Shepherd, Dr. R. D. Purchon and Mr. G. T. Jefferson)	19
U.M.G.	Miss U. M. Grigg	3
V.B.	Miss V. Barnes	2
W.A.L.E.	Mr. W. A. L. Evans	1
W.J.	Mr. W. Jones	1

The names of animals in the list are those used in the new 1957 edition of the Plymouth Marine Fauna, which was consulted prior to its publication with the courteous permission of the Director of the Marine Biological Association and with the helpful assistance of Dr. D. P. Wilson. Thus, in the present list, no reference is given to the original diagnostic description of a species where it is given in the Plymouth list. In a few cases, a Dale species is not recorded at Plymouth, and the full reference is cited here.

Common names of animals and of groups have been added where these are known and in addition page references are given to the few selected works, listed below, which have a brief description or an illustration of the species. The references are made by means of the initial letter given :—

BY=Barrett, John H. and C. M. Yonge. *Guide to the Seashore.* In the press. (References under BY are to Plates—pages not yet known.)

C=Colman, J. S. *The sea and its mysteries.* Bell & Sons, London, 1950.

DW=Wilson, D. P. *Life of the shore and shallow Sea.* Nicholson & Watson, London 1935.

E=Eales, N. B. *The littoral fauna of Great Britain.* Cambridge University Press. 1939.

H=Hardy, A. C. *The open sea. The world of plankton.* Collins. London 1956.

RY=Russell, F. S. and C. M. Yonge. *The Seas.* Warne. London 1936.

TJ=Travis, Jenkins J. *The fishes of the British Isles.* Warne. W rne. London 1942.

W=Wilson, D. P. *They live in the sea.* Collins. London 1947.

Y=Yonge, C. M. *The Sea Shore.* Collins. London 1949.

Of these books, Eales is almost a *sine qua non* for the beginner although there are other works, for example, by Newbiggin, M. (*Life by the seashore,* revised by R. Elmhurst, Allen & Unwin, London 1931) which has a similar scope ; and by Street, P. (*Between the tides,* U.L.P. London, 1952) which is a good simple account, well illustrated, but without the keys and systematic details to be found in Eales. The forthcoming *Guide to the Seashore* by John H. Barrett and C. M. Yonge is a very well illustrated and will deal with plants and animals of the shore and be useful particularly to beginners.

Colman's book is best described as a primer in oceanography but for the seashore collector it contains, in addition to the illustrations referred to in the present list, a good general account of the plant and animal plankton (chaps. 4 and 5) and, still more appropriate, a very useful and brief presentation of life between tide marks (chap. 8).

Wilson's two books are full of good photographs of seashore animals ; this often leads one to overlook the text which is authoritative and comprehensive.

In *The Open Sea* by Hardy is a stimulating account of the plankton, an aspect of life in the sea which is often ignored by shore collectors but for the study of which the Field Centre provides facilities.

The Seas, by Russell and Yonge, considers all aspects of marine life including commercial fisheries and contains much useful information clearly presented and well illustrated. Yonge's *Sea Shore* has, as its title suggests, a more limited scope but, in addition to being well illustrated, is far and away the best account of the natural history of the shore.

There is only one single volumed work on the fishes of the British Isles and Travis Jenkins' book will provide the beginners requirements in this field.

In the following list, if a species has been recorded only a few times the details of its occurrence are given together with the initials of the recorders. Where, however, the species is fairly common the records are summarised, the individual records and recorders are not cited, and the only acknowledgment is that made in the list of recorders given above. The data, where available, are given in the following order :—Localities ; Habitat ; Abundance ; Season ; Breeding.

In addition, some notes of the biology of the species is added from the literature where this will increase the value of the list.

The localities cited are of intertidal records on the ' home ' grounds given in order from Musselwick to Dale Point and thence to West Dale Bay (Fig. 2) : ' outside ' records are then added in a less regular order followed by sublittoral records (Fig. 1). Records for Skokholm and Skomer are listed after the names of these islands (Fig. 3).

The three maps show most of the collecting grounds named in the list and in the Dale Peninsula (Fig. 2) we have divided the coastline into named ' beaches ' in the hope that future records will be referred to these localities. The extensive Gann Flats has been divided by ' sight lines ', easily recognisable on the shore, so that easier reference may be made to the four areas. Dale Sands and Dale Roads have also been delimited by similar arbitrary sight lines.

There are two ' Great Castle Heads '—one at West Dale and one at Sandy Haven. It is proposed to call the former ' Great Castle Head ' and the latter ' Great Castle Head, S.H.'. Watch House Point (at Lindsway Bay) is sometimes called ' Soldier's Rock ' and should not be confused with Blockhouse (or West Blockhouse) Point on the Dale Peninsula.

FAUNA LIST

Phylum PROTOZOA

Protozoa are numerous in all marine habitats and occur as free-swimming, creeping or attached forms. On account of their small size they are usually overlooked by collectors and indeed, their study requires special techniques and collecting methods. A brief account of the group will be found in Eales (pp. 13, 17 and 18) and there is more information in Johnstone, Scott and Chadwick (*The Marine Plankton*, Hodder and Stoughton, 1934), and in Hardy's book. The few species listed here serve merely as a reminder of the many not recorded.

(Similar remarks might be made concerning the bacteria which play at least as important a part in the sea as on land or in fresh water : but their study involves the collector in even more detailed and complex techniques.)

Noctiluca scintillans Macartney (H 48 ; RY 187)
Plankton, Dale, 13.8.50, (EMT) ; 27.9.50, (EMS). Skokholm—North Haven, abundant, 7.7.49, (CM).

Ceratium furca (Ehrenberg) (H 80)
Plankton, 25.9.50, (EMS).

Ceratium fusus (Ehrenberg)
Plankton, 25.9.50, (EMS).

Ceratium tripos O. F. Müller (RY 110, 124 ; H 48, 80)
Plankton, common, 25.9.50, (EMS).

Haplosporidium chitonis (Lankester)
Parasite in *Lepidochitona cinereus*, Black Rocks, Sept. 1948, (UCL).

Haliphysema tumanowiczii Bowerbank
Skokholm—Little Bay, 14 and 16.8.50, (RH).

Phylum PORIFERA Sponges (E 13, 19, 21)

The sponge body is usually an irregular mass of tissue spread out on a solid substratum. The tissue is permeated by a system of canals into which water is drawn through minute pores all over the surface. The water leaves by large visible pores dotted about on the surface and frequently raised on a volcano-like prominence. Organic food particles are extracted from the current within the sponge. The system is easily clogged and sponges are usually intolerant of muddy conditions. The tissue is supported by needle-like spicules of calcareous or siliceous material, or by horny filaments often welded together into a complex scaffolding.

While often of a dull colour some sponges contain bright pigments and colours vary from pure white through yellows and browns to bright reds. One species is bright blue. Some species are regular in shape but most are not so. Some are always of one colour but many vary considerably so that shape and colour are only occasionally of value in identification.

Class CALCAREA. Calcareous sponges

Homocoelidæ (E 23 as Leucosoleniidæ)

LEUCOSOLENIA sp. (E 23 ; W 13)

Unidentified species of the genus have been seen at Musselwick, Point Wood Beach, Castle Beach, at South Haven on Skokholm and at the Basin on Skomer.

Sycettidæ

SYCON CILIATUM (Fabricius) = *S. coronatum* (E 24 ; W 13 ; BY Plate 1)

Musselwick Point, Point Wood Beach, Castle Beach, Martin's Haven, Angle Bay, dredged in Dale Roads. L.W.M. and below. March, April, July, August and September.

Grantiidæ

GRANTIA COMPRESSA (Fabricius) Purse sponge (E 24 ; W 10 ; BY Plate 1)

Musselwick Point, rare ; Point Wood Beach ; Castle Beach, common ; Gunkel ; Great Castle Head, common ; Gateholm ; Angle Bay. SKOHOLM—Peters Bay, abundant ; Crab Bay, frequent ; North Haven, frequent. SKOMER—South Haven. March, April, May, September. In crevices and under boulders below H.W.N.T.

LEUCONIA IMPRESSA (Hanitock) (E 25)
Gateholm, 1949, (RDP).

Class DEMOSPONGIARIA. Siliceous and horny sponges

Oscarellidæ

OSCARELLA LOBULARIS (O. Schmidt) (E 29)

Musselwick, (RDP) ; Black Rocks, Common L.W.S.T., as shiny khaki spots on polyzoa and algae, or as larger toffee-coloured areas with irregular and not raised oscula, 31.10.51, (JHB).

Geodiidæ

PACHYMATISMA JOHNSTONI (Bowerbank) Elephant hide sponge (E 28 ; BY Plate 1)

Castle Beach, Great Castle Bay, Lindsway Bay, Gateholm. SKOKHOLM—South Haven, Peters Bay, Crab Bay. SKOMER.—The Basin, South Haven, Mew Stone, Matthew's Wick. March, April, August. Near L.W.M. Dark purplish-grey in light, and white in the dark. Often large.

Clavulidæ

POLYMASTIA MAMMILLARIS (O. F. Müller) (E 28)
Great Castle Bay, below M.T.L., 4.4.50, (NWM).

POLYMASTIA AGGLUTINANS Ridley and Dendy
Black Rock, common, L.W.S.T., 31.10.51, (JHB).

SUBERITES DOMUNCULA (Olivi) (=*Ficulina ficus* (L.) (E 26 ; Y 93)
Black Rocks, Brig Stones, Point Wood Beach and Angle Bay. Common on shells inhabited by hermit-crabs. L.W.S.T. Yellow and orange. March and October.

SUBERITES CARNOSUS (Johnston)
Dale Sands, (RDP).

TERPIOS FUGAX Duchassaing and Michelotti. Blue sponge (E 26)
Musselwick Point, Gann Stones, Point Wood Beach, Slip Pier Beach, Dale Fort Beach, Castle Beach, Martin's Haven. Not common under boulders, L.W.S.T. March, April, August, September.

CLIONA CELATA Grant Boring sponge (E 25 ; W 51 ; DW Frontispiece ; RY 147)
Musselwick Point, Point Wood Beach ; dredged off Musselwick Point and in Dale Roads. Under boulders and in oyster shells. March, August, September.

Astraxinellidæ

STELLIGERA STUPOSA (Montagu)
Gateholm, (RDP).

Axinellidæ

HYMENIACIDON PERLEVIS (Montagu) (=*H. sanguinea*) (E 27 ; Y Plate 25b, p. 144, wrongly labelled ; BY Plate 1)
Musselwick Point, Black Rocks, Point Wood Beach, Slip Pier Beach, Dale Fort Beach, Dale Point, Gateholm, Angle Bay. SKOKHOLM—Peter's Bay, Crab Bay, North Haven. SKOMER.—South Haven, Mewstone. Occasional to abundant. March, April, August to November. Pale olive, green, yellow, pale orange, orange, red, brown. Oscula sometimes obvious, sometimes not. At Black Rocks growing in the sand.

ADOCIA CINEREA (Grant) (E 27)
Dale Fort Beach, 28.3.53, (MRY) : Dale Point, one in deep cleft, L.W.S.T., pink-brown with regular, prominent oscula, (det. M. Burton), (JHB).

Halisarcidæ

HALISARCA DUJARDINI Johnston (E 29)
Black Rocks, common, L.W.S.T., flat, dark toffee coloured with irregular oscula, (det. M. Burton), (JHB).

Spongiidæ

DYSIDEA FRAGILIS (Montagu) (E 29)
Castle Beach, occasional, L.W.S.T., 11.4.49, (RDP) : Black Rocks, common, L.W.S.T., embedded in muddy sand, of a dark toffee colour, shapeless and without visible oscula, 31.10.51, (det. M. Burton), (JHB).

Haplosceridæ

HALICLONA MACANDREWI (Bowerbank)
Slip Pier Beach, (RDP).

Desmacidonidæ

BIEMA VARIANTIA (Bowerbank)
Castle Beach, (RDP).

AMPHILECTUS FUCORUM (Esper.)
Dale Point, L.W.S.T., in holdfasts of *Laminaria* on exposed rocks, 1.11.51, (det. M. Burton), (JHB).

MYCALE CONTARENI (Martens)
Castle Beach, (RDP).

MYXILLA INCRUSTANS (Johnston) (E 28 ; BY Plate 1)
Musselwick, Dale Point, Castle Beach, Gateholm. SKOKHOLM—South Haven. Common at Dale Point, 1.11.51, on exposed faces, as thick cushiony straw-yellow colonies with regular oscula (JHB).

MYXILLA ROSACEA (Lieberkühn)
Dale Point, 1.11.51, L.W.S.T., common as flat, orange masses without visible oscula and abundant as very close textured cushions of a brick-red to dry-blood colour, (det. M. Burton), (JHB).

MICROCIONA ATRASANGUINEA Bowerbank (E 28)
Black Rocks, L.W.S.T., occasional as very thin orange-blood red layers of gritty consistency, no oscula visible, 31.10.51 ; Dale Point, L.W.S.T., common as scarlet rings around groups of *Balanus*, tending to grow over shells, 1.11.51, (det. M. Burton), (JHB).

OPHLITASPONGIA SERIATA (Grant) (E 27 ; BY Plate 1)
Dale Point, Castle Beach. SKOKHOLM—South Haven. Common, L.W.S.T. At Dale Point, thin encrusting growths of a brick red (almost dried blood) colour, with obvious, well-spaced, upraised oscula, (JHB).

HALICHONDRIA PANICEA (Pallas) Bread crumb sponge (E 26 ; W 10 ; Y 245 (wrongly labelled) ; RY 29 ; BY Plate 1)
Widespread and abundant, all beaches and seasons.

HALICHRONDRIA BOWERBANKI Burton
Dale Point, L.W.S.T., abundant on overhangs as small thin straw-coloured or yellow fingers hanging from growths of *Myxilla incrustans*, (JHB).

Phylum **COELENTERATA** (E 13, 31, 36)

The coelenterates are characterised by the possession of nematocysts which are used to kill or entangle small living animals for use as food. Ciliary mechanisms are sometimes used to transfer these small organisms to the mouth but tentacles are more usually employed.

Class HYDROZOA (E 31 and 36)

Order HYDROIDA (Medusæ H 96 onwards)

Hydroids are not a prominent feature of the Dale intertidal zone because much of the shore is too exposed and the sheltered shores (as in Dale Bay) somewhat muddy. Nevertheless careful search reveals quite a variety of species tucked away in sheltered corners and the sub-littoral supplies good growths of the usual deep water species.

Sub-Order ANTHOMEDUSÆ (=Athecata in part) (E 37 ; medusæ W 19 ; H 49)

Tubulariidæ (E 38 ; W 16 ; Y 137)

TUBULARIA INDIVISA L. Oaten pipes hydroid (BY Plate 2)
Common on Skokholm and Skomer.

Corynidæ

CORYNE MUSCOIDES (L.) (E 38 ; BY Plate 1)
Musselwick, L.W.M., 16.6.50, (JHB).

CORYNE PUSILLA Gaertner
SKOKHOM—Little Bay, Hog Bay and South Haven, August 1950, (RH).

Clavidæ Club head hydroids

CLAVA CORNEA (T. S. Wright)

On *Fucus serratus*, L.W.N.T., 10.4.49, (RDP).

CLAVA LEPTOSTYLA (Agassiz)

Musselwick, one colony, 10.6.49, (JHB).

CLAVA MULTICORNIS (Forskal) (E 37; BY Plate 3; for related spp. W 15; Y 136; BY Plate 2)

Gann Stones, (RDP): SKOKHOLM—Peter's Bay, rare, 21.7.55, (KST).

Hydractinidæ

HYDRACTINEA ECHINATA (Fleming) (Y 157, BY Plate 2)

Lives on shells inhabited by hermit crabs. Black Rocks, L.W.S.T., 28.3.48, (RDP): Gann Flats, 6.3.50; but none on 9.4.51, (JHB): dredged, 28.7.49, (GO): Angle Bay, April 1953, (UB).

Eudendriidæ

EUDENDRIUM RAMOSUM (L.)

SKOKHOLM—On lobster pots from Mr. F. Sturley. Up to 13 inches long, 26.6.50, (JHB).

EUDENDRIUM CAPILLARE Alder

SKOKHOLM—Little Bay, on *Tubularia indivisa*, 16.8.50, (RH).

Sub-Order THECATA (=Calyptoblastea, E 39; medusæ, H 96)

Campanulariidæ (E 39)

CAMPANULARIA VOLUBILIS (L.)

SKOKHOLM—North and South Havens, Peter's Bay, August 1950, on *Sertularia cupressina* and *Plumularia setacea*, (RH).

CAMPANULARIA HINCKSI Alder

SKOKHOLM—North Haven on *Halecium* and *Halopteris*, 12.8.50, (RH).

CLYTIA JOHNSTONI (Alder)

SKOKHOLM—North and South Havens, Little Bay, on *Tubularia indivisa*, *Scrupocellaria reptans* and *Laminaria* holdfasts, August 1950, (RH).

OBELIA DICHOTOMA (L.) (E 39)

Musselwick, covering fruiting bodies of *Fucus*, washed ashore, medusæ being released, 30.6.50, (JHB): Slip Pier Beach, a little in high rock pools, 23.3.48, (RDP): Dale Roads, enormous quantities on *Chorda filum*, trawled, 12.9.50, (JHB).

Obelia geniculata (L.) (E 39 ; BY Plate 1)

Gann Flats, March 1949, (NWM). Skokholm—On *Laminaria digitata,* abundant, releasing medusæ, 13.8.50, (RH) : Crab Bay, 23.4.52, (KCM).

Obelia flabellata Hincks (Hincks, p. 157)

Gann Glats, abundant, ripe, on *Fucus serratus,* 8.9.49, (RDP).

Laomedia flexuosa Hincks (E 40)

Gann Flats, March 1949, (NWM). Skokholm—South Haven, fertile, 18.8.50, (RH).

Reticularia (Filellum) serpens (Hassall)

Skokholm—North Haven, on *Sertularia cupressina* and var. *argentea,* 16.8.50, (RH).

Lovenellidæ

Calycella syringa (L.)

Skokholm—North Haven, rare, August 1950, (RH).

Phialellidæ

Opercularella lacerta (Johnston)

Skokholm—Little Bay, North Haven, rare, August 1950, (RH).

Haleciidæ

Halecium halecinum (L.)

Dale Roads, dredged, 23.3.49, (DWS) ; 17.9.49, (GO) : Skokholm—North Haven, rare, 12.8.50, (RH).

Sertulariidæ (E 40)

Diphasia attenuata (Hincks)

Skokholm—North Haven, among *Bryopsis plumosa,* 16.8.50, (RH).

Diphasia rosacea (L.)

Skokholm—North Haven, rare, on *Sertularia cupressina ;* Little Bay, rare, on *Tubularia indivisa,* August 1950, (RH).

Dynamena pumila (L.) (E 40 ; Y 141 ; BY Plate 1)

Gann Stones, abundant ; Point Wood Beach ; Slip Pier Beach ; Castle Beach, abundant ; Great Castle Head, common. Skokholm—Peter's Bay, common ; South Haven, Little Bay and Crab Bay, rare. Under boulders and on *Fucus serratus.* March, April, August and September.

Sertularella polyzonias (L.) (E 41)

Castle Beach, rare, under boulder, 27.8.49, (GO). Skokholm—North Haven, rare, 12.8.50, (RH).

SERTULARELLA RUGOSA Gray

SKOKHOLM—Common on lobster pots from Mr. F. Sturley, 26.6.50, (JHB).

SERTULARELLA MEDITERRANEA Hartlaub

SKOKHOLM—Little Bay, L.W.S.T., 16.8.50, (RH).

HYDRALLMANIA FALCATA (L.)

SKOKHOLM—North Haven, rare, 16.8.50, (RH).

SERTULARIA CUPRESSINA (L.) including var. ARGENTEA

SKOKHOLM—On lobster pots from Mr. F. Sturley. Up to 17 inches long, 26.6.50, (JHB). North and South Havens, rare, August 1950, (RH).

SERTULARIA OPERCULATA (L.) (BY Plate 1)

SKOKHOLM—On lobster pots from Mr. F. Sturley, 26.6.50, (JHB). Dead pieces washed up in North and South Havens, Peter's Bay, August 1950, (RH).

Plumulariidae Feather hydroids (E 41 ; W 18)

MONOTHECA OBLIQUA (Johnston)

SKOKHOLM—North and South Havens, on *Laminaria* holdfasts with Polyzoa, rare, August 1950, (RH).

PLUMULARIA SETACEA (Ellis and Solander) (E 41)

Stack Rock, abundant on sponge under stone, 25.9.53, (EMS). SKOKHOLM—North and South Havens, Little Bay, on weeds and *Tubularia indivisa*, August 1950, (RH).

PLUMULARIA CATHARINA Johnston

SKOKHOLM—North Haven, on stem of *Halecium* with *Campanularia hincksi*, 12.8.50, (RH).

NEMERTESIA ANTENNINA (L.)

SKOKHOLM—Common on *Maia squinado* from Mr. F. Sturley, 26.6.50, (JHB) ; dead colonies frequently washed up.

NEMERTESIA RAMOSA (Lamouroux)

Great Castle Head, dead colony 26 inches long, 29.7.50, (JHB).

AGLAOPHENIA PLUMA (L.)

Musselwick, one in pool, L.W.M., 28.3.48, (RDP) : Gann Flats, common on *Halidrys siliquosa*, 1.7.50, (JHB). SKOKHOLM—North Haven, Peter's Bay, Wreck Cove and Hog Bay, on *Laminaria* holdfasts, with corbulæ, August 1950, (RH).

Order CHONDROPHORA

Velellidæ

VELELLA VELELLA (L.) (RY 132 ; H 111-2 ; BY Plate 3)

This floating sub-tropical species washes alive onto British shores when oceanic and local wind and current conditions are suitable. It was recorded on 24.4.49, rare ; 27.7.50, rare ; 10.8.50, abundant ; 3.8.51, rare ; 15.8.53, rare ; 20.8.53, rare ; July(?) 1954, rare ; 9.7.56, common.

Order SIPHONOPHORA

Physaliidæ

PHYSALIA PHYSALIS (L.) Portuguese man-of-war (W 25–29 ; C 247–254 ; H 112 ; 118–121 ; BY Plate 3)

This floating, sub-tropical species with a virulent sting, washes alive onto British shores as with *Velella.* It has, however, only been recorded from Skokholm and Skomer. 8.10.53, two ; 17.10.54, one ; 18.10.54, one ; 19.10.54, six.

Class SCYPHOMEDUSÆ (E 32)

The floating jellyfishes require special methods of collection and only a few species have been noted. The attached Stauromedusæ have, however, been recorded by hand collecting.

Order STAUROMEDUSÆ (E 42)

Eleutherocarpidæ (=Lucernariidæ)

HALICLYSTUS AURICULA (Rathke) (E 43 ; W 23 ; BY Plate 3)

Great Castle Head, West Dale Bay, Gateholm. SKOKHOLM—Peter's Bay, Crab Bay. On *Cladophora rupestris*, *Chondrus crispus*, *Ceramium*, *Rhodymenia palmata* and *Enteromorpha*, in pools at L.W.M. and at L.W.E.S.T. Common. March, July, August, September.

LUCERNARIOPSIS CAMPANULATA Lamouroux (E 43)

Great Castle Head, Martin's Haven. SKOKHOLM—South Haven, Peter's Bay, Crab Bay. Rare at L.W.S.T. on *Himanthalia lorea* and on red weeds, especially *Gigartina.*

LUCERNARIA QUADRICORNIS O. F. Müller (E 43)

Gann Flats, one on *Laminaria*, L.W.S.T., 25.8.54, (ORB).

Order SEMÆOSTOMÆ

Pelagiidæ

CHRYSAORA HYOSCELLA (L.) (Y 21 ; H 128 ; BY Plate 4)

Cast ashore in various places, sometimes in large numbers. July and August, 1949 and 1950.

CYANEA CAPILLATA (L.) var. LAMARCKI Péron and Lesueur (Y 21 ; RY 84 ; H 127, 128 ; BY Plate 3)

Rare, July, 1951 and 1954.

Aureliidæ

AURELIA AURITA (L.) Common jelly fish (W 20, 21 ; Scyphistoma and ephyra, DW 132 ; Y 16, 17 ; H 106, 113, 123 ; BY Plate 4)

Widespread, occasionally abundant, June and July, 1949, 1950, 1952, 1955, 1956.

Order RHIZOSTOMÆ

Rhizostomidæ

RHIZOSTOMA OCTOPUS (L.) (Y 21 ; H 107, 128, 130 ; BY Plate 4)

Rare, January, June, July, December, 1949, 1950. With *Hyperia galba.*

Class ANTHOZOA (=Zoantharia, E 33)

The anemones are well represented by both rock living and mud living species. Most species are Actiniarians but the two British solitary corals and the related *Corynactis*, of the Madreporaria, are also present in the area.

Sub-Class HEXACORALLIA

Order ACTINIARIA (E 44)

Halcampidæ

HALCAMPA CHRYSANTHELLUM (Peach) (E 45)

Gann Flats, one, 6.3.54, (JM).

PEACHIA HASTATA Gosse (E 45 ; BY Plate 5)

Dale Sands, L.W.S.T., two, 28.3.48 ; several, September 1948, (RDP) : three, September 1949, (GO).

Actiniidæ (E 46)

ACTINIA EQUINA L. Beadlet (E 46 ; W 34, 87 ; Y 81 ; RY 4 ; BY Plate 5)

Common on all rocky shores including colour varieties. The variety *fragacea* is recorded from Point Wood Beach, Gunkel and Skokholm. Viviparous.

ANEMONIA SULCATA (Pennant) Opelet or Snake-locks (E 46 ; W 33 ; DW 48 ; Y 85 ; BY Plate 5)

Common in several localities including colour varieties. Usually in rock pools and crevices.

TEALIA FELINA (L.) var. CORIACEA (Cuvier) Dahlia (E 46; W 31, 32; DW 104; Y 84; BY Plate 6)
Fairly common on all rocky shores.

BUNODACTIS VERRUCOSA (Pennant) Gem (E. 47; BY Plate 6)
Fairly common on all rocky shores. Young produced, 24.4.52, (JHB).

ANTHOPLEURA THALLIA (Gosse) Glaucous pimplet (E 47; BY Plate 6)
SKOKHOLM—South Haven, one, 15.8.47, (CT).

Metridiidæ

METRIDIUM SENILE (L.) var. DIANTHUS (Ellis) Plumose (W 37; DW 132; Y 84; BY Plate 6)
Angle Beach, L.W.S.T.; one, April 1953; one, 5.4.54 (UB).

Hormathiidæ

CALLIACTIS PARASITICA (Couch) Parasitic (W 61; DW 136; Y 163; BY Plate 6)
Stack Fort, one on *Buccinum undatum* shell with *Eupagurus prideauxi*, 6.7.56, (JHB)

ADAMSIA PALLIATA (Bohadsch) Cloak (DW 136; BY Plate 6)
With *Eupagurus*. Musselwick, one, March 1955, (UB): dredged near Monk Haven, 3.9.51, (EMT) and near Watch House Point, 19.8.52, (JHB).

Sagartiidæ

SAGARTIA ELEGANS (Dalyell) (E 48; RY 46; BY Plate 7)
Occasional, several colour varieties, L.W.M. Musselwick, Castle Beach, Great Castle Head and Bay, Monk Haven, Martin's Haven. SKOKHOLM—South Haven, Crab Bay, Frank's Point.

SAGARTIA TROGLODYTES (Price) (E 48; BY Plate 7)
Occasional, sometimes in pools. Gann Stones, Gann Flats, Point Wood Beach, Castle Beach, St. Bride's Bay, SKOKHOLM—Peter's Bay, Crab Bay.

ACTINOTHOE SPHYRODETA (Gosse)
Castle Beach. SKOKHOLM—Little Bay. SKOMER—Mew Stone. L.W.S.T.

ACTINOTHOË ANGUICOMA (Price) (E 49)
Black Rocks, sand, L.W.S.T., one, 28.8.53, (VB).

CEREUS PEDUNCULATUS (Pennant) (E 48; BY Plate 7)
Musselwick, Gann Flats, Gunkel, Watwick Bay, Angle Bay. In pools at Watwick but on stones in muddy sand over an extensive area on Dale Sands on the razor shell bed. Viviparous breeding, 3.4.54, (VB).

Order MADREPORARIA Corals (E 50)

Turbinolidæ

CARYOPHYLLIA SMITHI Stokes Devonshire cup-coral (E 50 ; W 39 ; Y 92 ; BY Plate 7)

Wide but irregular distribution at L.W.E.S.T. Musselwick, Castle Beach, Gunkel, Gateholm. SKOKHOLM—Crab Bay, East Bay. SKOMER—Mew Stone, Basin, North Haven.

Corallinomorphidæ

CORYNACTIS VIRIDIS Allman Jewel anemone (E 49 ; W 40 ; Y 85)

Castle Beach, several, 7.9.56, (UCW). SKOMER—Mew Stone, April 1946, (VB) (a coral with no skeleton but it has the knobbed tentacles. Not necessarily green).

Eupsammiidæ

BALANOPHYLLIA REGIA Gosse (DW 104)

SKOKHOLM—Crab Bay, two, L.W.S.T., 23.4.55. SKOMER—South Haven, Basin, Mew Stone, April 1946, (UB).

Phylum **CTENOPHORA** (E 36)

The sea gooseberries or comb-jellies like jellyfish and medusae, are transparent floating animals and although common in the plankton, they occur only occasionally stranded on the shore or alive in rock pools.

PLEUROBRACHIA PILEUS (O. F. Müller) (E 50 ; DW 132 ; Y 22 ; H 107, 135–7, 144 ; BY Plate 2)

In plankton, 24.9.53, (CTJ) ; 6.7.49, (CM) ; 26.6.56, (NC).

BEROE CUCUMIS Fabricius (H 144 ; BY Plate 2)

In plankton, 28.3.48, (RDP).

Phylum **PLATYHELMINTHES** Flat-worms (E 13, 53)

Class TURBELLARIA (E 53)

Order TRICLADIDA (larva H 183)

Procerodidæ

PROCERODES ULVÆ (Oersted) (E 54 ; BY Plate 2)

This interesting animal lives under stones only where fresh water streams flow over the sea shore and is capable of living in sea water and in almost entirely fresh water. Gann Flats, Point Wood Beach, Castle Beach, Gunkel, Mill Bay, Marloes Sands, Monk Haven. Egg capsules noted, 8.4.49, (RDP).

Order POLYCLADIDA

Polyclad flatworms must be handled carefully and brought home in individual vessels. Otherwise they are likely to disintegrate.

Leptoplanidæ

LEPTOPLANA TREMELLARIS (O. F. Müller) (E 54)
Occasional specimens. Musselwick, Gann Flats, Slip Pier Beach, Great Castle Head, Gateholm, Monk Haven, Angle Bay, Dale Roads (dredge) and Skokholm.

Euryleptidæ

PROSTHECERAEUS VITTATUS (Montagu) (Y 159 ; BY Plate II)
Occasional under boulders or in *Laminaria* holdfasts. Musselwick Point, Gann Flats, Point Wood Beach, Dale Beach.

STYLOSTOMUM VARIABILE Lang
SKOKHOLM—South Haven, two, 18.7.55, (KST).

Class TREMATODA (E 53)

The parasitic flat-worms, both Trematodes (flukes) and Cestodes (tape-worms) must be searched for in or on their hosts. The single species recorded here merely means that no one has looked for the many species which must be present.

Order MONOGENEA

Hexabothriidæ

RAJONCHOCOTYLOIDES EMARGINATA (Ollson)
Dale Roads, on gills of skates, trawled, September 1948, (RDP).

Phylum **NEMERTINI** (E 13, 56 ; larva H 183)

Class ANOPLA

Order PALÆONEMERTINI

Tubulanidæ

TUBULANUS ANNULATUS (Montagu) (E 57 ; Y 152 ; BY Plate 8)
One or two at Musselwick, Gann Flats, Martin's Haven. Up to 20 cm. long.

Lineidæ (E 59)

LINEUS LONGISSIMUS (Gunnerus) Bootlace worm (E 59 ; Y 142 ; BY Plate 8)
Point Wood Beach, Castle Beach. SKOKHOLM—Crab Bay and SKOMER—North Haven. Occasional. Common at Gann Stones where 4 metres is a common length.

LINEUS BILINEATUS (Renier)

Dale Sands, L.W.E.S.T., two, 14.4.49 (RDP) ; one, 26.8.49, (GO).

LINEUS RUBER (Müller) (E 59 ; BY Plate 8)

Point Wood Beach, Dale Beach, Dale Fort Beach, Castle Beach. SKOKHOLM—South Haven (up to 8 cm. long) and North Haven. Occasional. March, May, August.

LINEUS GESSERENSIS (Müller) (E 59)

Musselwick, Point Wood Beach (common), Slip Pier Beach, Castle Beach, Angle Bay. March, April, November. Both green and red varieties. On 10.4.49, of two specimens of the red variety in gelatinous tubes, one had morulae at the 8 cell stage and the other about 200 active, colourless young each with two pink eyespots (JHB).

MICRURA FASIOLATA Ehrenberg

Castle Beach, one, L.W.S.T., 11.4.49, (RDP).

CEREBRATULUS MARGINATUS Renier

Gann Flats and Dale Beach below M.L.T. Rare, up to 13 cm. long. March, August, September, (det. S. Prudhoe).

Class ENOPLA

Order HAPLONEMERTINI

Emplectonematidæ

EMPLECTONEMA GRACILE (Johnston)

Watwick Bay, one, 19.7.51, (det. S. Prudhoe), (SP).

EMPLECTONEMA NEESI (Oersted)

Slip Pier Beach, three, 12.4.49, (RDP) ; Watwick, several, (det. S. Prudhoe), 19.7.51, (JHB).

Prosorhochmidæ

OERSTEDIA DORSALIS Abildgaard

Great Castle Bay, one on *Polyides caprinus*, L.W.S.T., 7.3.54 ; one on holdfast of *Laminaria digitata*, 25.4.55, (AFB) : Dale Roads, dredged, 1.9.49, (GO).

Amphiporidæ

AMPHIPORUS LACTIFLOREUS (Johnston) (E 57 ; BY Plate 8)

Musselwick, Point Wood Beach, Slip Pier Beach. SKOKHOLM—Crab Bay, North Haven. March, April, June, July, November. Occasional. On the Gann Flats it was common in March 1949, but absent in July and August 1949, (NWM).

Tetrastemmatidæ

TETRASTEMMA MELANOCEPHALUM (Johnston)
Gann Saltings, common at edge of *Scirpus* area, 11.8.55, (JM).

TETRASTEMMA CANDIDUM (O. F. Müller)
Great Castle Bay, one on *Polyides caprinus*, L.W.S.T., 7.3.54, (JM).

Phylum **ANNELIDA** (E 14, 60)

Class POLYCHÆTA (E 62, 63 ; Larvæ DW 111 ; H 181, 185)

This important marine group of segmented worms is well represented at Dale in all habitats. The active or errant species usually have an armed proboscis and are carnivores or scavengers. The burrowing and tubicolous species usually have tentacles and are detritus eaters or ciliary filter-feeders. Eggs and sperm are discharged into the sea water and the larvæ are planktonic, eventually settling on a substratum appropriate to adult life. The larvæ are selective in their choice of substratum and can delay metamorphosis until a suitable place is found : in *Spirorbis* they settle near adults of their own species. Some eggs are laid in gelatinous masses attached to rock or seaweed (or sometimes on sand) and in other cases eggs are stored after fertilisation in the tube or in a special brood pouch (e.g. the operculum of some *Spirorbis* species) or, as in some syllids, the eggs may be stuck onto the body. In some cases the larval stages are of several weeks duration but in others it may be a few hours (e.g. *Spirorbis*): in others development is direct.

Ripe tubiculous worms which spawn into the sea will usually do so immediately they are extracted from their tubes, and as the sexes are often of different colours when ripe, artificial fertilisations are easily made.

The tubicolous and burrowing worms of the mud and gravel habitat are very well represented in Dale and Angle Bays.

ERRANTIA The errant polychaetes (E 63)

Aphroditidæ Scale worms (E 65)

Mainly rocky shore animals.

APHRODITE ACULEATA L. Sea mouse (E 65 ; Y 249, 252 ; BY Plate 9)
Gann Flats, Dale Sands, L.W.E.S.T. ; Dale Roads. SKOMER North Haven, dredged. March, April, September, 1948-49-51 and 55. This species burrows in the surface layers of a muddy sand bottom in the sub-littoral. It is occasionally exposed by extreme tides or washed up by heavy gales.

LEPIDONOTUS SQUAMATUS (L.) (E 66; BY Plate 11)
Musselwick, Point Wood Beach, Slip Pier Beach, Castle Beach, Great Castle Head, Angle Bay, Dale Roads (dredged). SKOKHOLM—Crab Bay. Common. March, September.

LEPIDONOTUS CLAVA (Montagu) (E 66)
Castle Beach, L.W.S.T., one, 27.8.49, (GO): Dale Roads, dredged, 16.9.49, (UCL); in *Laminaria* holdfasts from buoy, September 1948, (UCL). SKOKHOLM—Crab Bay, occasional, L.W.S.T., 14.9.54, (HJM).

GATTYANA CIRROSA (Pallas)
Dale Beach, 28.3.48, (RDP): Musselwick, March 1955, (UB).

HARMOTHOË IMBRICATA (L.) (E 66)
Musselwick, Gann Flats, Point Wood Beach, Slip Pier Beach. SKOKHOLM—Crab Bay, Peter's Bay. Common. March, April, September.

HARMOTHOË SPINIFERA (Ehlers)
Gann Stones, 28.3.48; 8.4.49, (RDP).

HARMOTHOË RETICULATA (Claparède)
Gann Flats South, one, under stone on gravel, 26.3.56, (UB).

HARMOTHOË LONGISETIS (Grube)
Gann Stones, Slip Pier Beach, 28.3.48, (RDP).

HARMOTHOË LUNULATA (Delle Chiaje) (E 66; Y 177, 240)
Gann Stones, Gann Flats, Point Wood Beach, Dale Fort Beach, Castle Beach, Angle Bay. Common. March, July, August.

LAGISCA EXTENUATA (Grube) (E 67; BY Plate 11)
Castle Beach, Great Castle Head, Gateholm, Martin's Haven, Angle Bay. SKOKHOLM—Crab Bay, South Haven. Rare. March, April, July, August, September.

POLYNOË SCOLOPENDRINA Savigny (E 68)
Musselwick Point, 28.3.48, (RDP); 11.8.49, (GO); March 1955, (UB): Point Wood Beach, 25.8.49, (GO). Rare.

LEPIDASTHENIA ARGUS Hodgson (DW 140)
Gann Flats South, commensal with *Amphitrite edwardsi*, September 1949, (GO).

HALOSYDNA GELATINOSA (M. Sars) (E 67; Y 143)
Musselwick (up to 2½ inches long), Point Wood Beach, Slip Pier Beach, Castle Beach, Martin's Haven, Angle Bay. Under boulders and in *Laminaria* holdfasts. Common. March, April, August, September.

SIGALION MALTHIDAE Audouin and M. Edwards
Gann Flats, L.W.S.T. Rare. March, September.

STHENELAIS BOA (Johnston) (E 67)

Musselwick Point, Gann Stones, Gann Flats, Dale Beach, Point Wood Beach, Slip Pier Beach, Castle Beach, Gateholm, Angle Bay, Dale Roads. SKOKHOLM—Peter's Bay, North Haven. L.W.M., under stones and in *Laminaria* holdfasts. Rare. March, April, July, August, September.

Amphinomidæ (E 68)

EUPHROSYNE FOLIOSA Audouin and M. Edwards

Musselwick, (RDP); Castle Beach, one, L.W.S.T., 28.8.49, (GO): Monk Haven, two dredged on stones covered with tunicates, 25.3.52, (NWM).

Phyllodocidæ (E 68; larva H 173)

Some of the species in this family are difficult to separate and simplified keys should be used with caution.

PHYLLODOCE LAMINOSA Savigny (E 69)

Gann Stones, Slip Pier Beach, Castle Beach, Gunkel, Gateholm, Martin's Haven. SKOKHOLM—Crab Bay. SKOMER—North Haven, South Haven, Mew Stone. L.W.S.T., under boulders. Rare. March, April. Egg masses, 28.3.48 and 2.4.46.

PHYLLODOCE LAMELLIGERA (Gmelin) (E 69)

Gann Stones, Castle Beach, Angle Bay; SKOKHOLM—South Haven. L.W.S.T., March, July, August. Up to 20 cm. long.

PHYLLODOCE MACULATA (L.) (BY Plate 9)

Dale Beach, September 1948, (UCL): Great Castle Head, 26.7.50, (MRY).

PHYLLODOCE MUCOSA Oersted

Musselwick, one, 25.3.56, (UB): Slip Pier Beach, 28.3.48, (RDP).

EULALIA VIRIDIS (O. F. Müller) (E 69, egg mass E 70; BY Plate 9)

Widespread: common under stones and among barnacles: also dredged. Egg masses recorded Dale, March 1949, (NWM); 9.4.51, (JHB): West Dale Bay, March (JHB); SKOMER—Mew Stone, 5.4.46, (UB).

EULALIA PUNCTIFERA (Grube)

Martin's Haven, 28.3.48, (RDP).

EULALIA (EUMIDA) SANGUINEA Oersted (E 69)

Gann Stones, rare, L.W.S.T., 11.8.49, (GO): Gann Flats, ripe specimens, common in *Laminaria* holdfasts washed ashore, 8.8.49, (GO): Slip Pier Beach, 28.3.48, (RDP).

Tomopteridæ

ENAPTERIS EUCHAETA (Chun)
Plankton, 23.8.49, (GO) : 5.8.52, (EMS).

TOMOPTERIS HELGOLANDICA Greeff
Plankton, September 1952, (GTJ).

Hesionidæ (E 74)

KEFERSTEINIA CIRRATA (Keferstein) (E 74)
Slip Pier Beach, 28.3.48, (RDP) : Dale Roads, dredged, 17.9.49, (GO). SKOKHOLM—Crab Bay, 12.4.48, (BW). Rare.

CASTALIA PUNCTATA (O. F. Müller)
Point Wood Beach, March 1955, (UB).

MAGALIA PERARMATA Marion and Bobretzky
Dale Roads, dredged, 17.9.49, (GO).

Syllidæ (E 70)

Many syllids are very small and easily overlooked. Identification is difficult and simplified keys are inadvisable.

SYLLIS SPONGICOLA Grube
Dale, in *Laminaria* holdfast from buoy, September 1948, (UCL).

SYLLIS AMICA Quatrefages
Castle Beach, one in *Laminaria* holdfast, 22.3.56, (UB).

SYLLIS KROHNI Ehlers (E 71)
Dale Point, one under sponge, L.W.S.T., 25.9.49, (GO).

PTEROSYLLIS FORMOSA Claparède (E 71)
Dale, in *Laminaria* holdfast from buoy, September 1948, (UCL): Castle Beach, one under boulder, L.W.M., 28.8.49, (GO).

AUTOLYTUS PICTUS (Ehlers) (E 73 ; W 49)
Point Wood Beach, one in *Fucus* holdfast, 24.3.55, (UB).

MYRIANIDA PINNIGERA (Montagu) (E 74)
Musselwick, one, on weed, 24.9.49, (UCL) : Point Wood Beach, one, under stone, L.W.M., 9.9.49, (GO).

Nereidæ

NEREIS PELAGICA (L.) (E 75)
Musselwick, Dale, Point Wood Beach, Castle Beach, Watwick Bay, Angle Bay. SKOKHOLM—Crab Bay, Crab Rocks. SKOMER—North Haven. Common. March, April, August, September. Under stones and in holdfasts, L.W.M.

NEREIS DIVERSICOLOR O. F. Müller (E 76 ; BY Plate 9)
Musselwick, Gann Flats, Gann Estuary up to Mullock Bridge and beyond : also stated to occur in *Laminaria* holdfasts near the

Slip Pier, and at Castle Beach; and from L.W.M. on SKOKHOLM—South Haven, Crab Bay, Peter's Bay.

This species is a brackish water animal not living in conditions of full salinity and capable of withstanding temporary dilution to less than 0.5 parts per thousand. It normally occurs on shores where fresh water flows over the beach and although often found in sand it is characteristically abundant in estuarine muds, where densities of up to 3,000 per sq. metre have been recorded. In one population a density of 300 in summer was reduced to a density of 50 during winter and spring. The worm lives in burrows and can feed either by seizing small animals or plant material in its jaws; by swallowing the surface detritus and its contained microfauna; or by creating, within the mouth of the burrow, a funnel of mucus threads which filters off detritus brought in by the irrigation movements of the body: the funnel and trapped particles are then swallowed.

A normal breeding population contains up to 10 per cent. males and both sexes turn green at maturity. Spawning takes place in late February (later further north) after several females have coiled round a single male. The larvæ live in the mud and adopt the adult mode of life after 10 weeks, at a length of 4 mm. These attain a length of 10 cm. by the next spawning period and then die. Since spawning only takes place in the presence of the other sex, some females do not spawn and live on to attain a large size, but die before the next spawning season.

NEREIS FUCATA Savigny (E 76)

Point Wood Beach, (GO): dredged off Musselwick, September 1948, (RDP); trawled, Dale Roads, 11.9.50, (EMT) and 25.3.52, (NWM): in *Buccinum* shells with hermit-crabs, rare. Also SKOKHOLM—South Haven, one in debris in pool, 15.8.47, (CT). This species can apparently live without association with hermit crabs and free living specimens should be preserved at the Centre for confirmation of identification.

PERINEREIS CULTRIFERA (Grube) (E 76; Y 151)

Musselwick, Gann Flats, Point Wood Beach, Slip Pier Beach. SKOKHOLM—North Haven, Peter's Bay. Common under stones, L.W.M. March, May, June, September, November.

PLATYNEREIS DUMERILI (Audouin and M. Edwards) (E 77; BY Plate 9)

Gann Flats, Brig Stones, Point Wood Beach, Castle Beach, Great Castle Head, Angle Bay and Skokholm: dredged off Musselwick and in Dale Roads. Lives in a membranous tube attached to weeds and *Laminaria* holdfasts. L.W.M. and below. Common. Young in tube, 22.3.56, (UB).

Nephthydidæ (E 77)

NEPHTHYS CAECA (O. F. Müller) (E 77)
Gann Mouth, absent, 1.4.49; present 31.3.50 (NWM): Dale Sands, one, 3.4.49, (RDP): Castle Beach, one, 25.7.49, (GO); one, 30.7.49, (NWM); several, 22.9.49, (UCL).

NEPHTHYS HOMBERGI Lamarck (E 77; BY Plate 10)
Gann Flats, one, 23.11.48, (NWM); March 1955, (UB): Black Rocks, in sand, 28.3.48, (RDP): Dale Sands, 26.7.50, (MRY): Monk Haven, several, 26.9.49, (UCL).

NEPHTHYS CIRROSA Ehlers (E 78)
Gann, L.W.N.T., 8.4.49, (RDP): Monk Haven, in sand, September 1948, (UCL).

Glyceridæ (E 78, 79)

GLYCERA GIGANTEA Quatrefages
Dale Roads, one dredged, 17.9.49, (UCL).

GLYCERA CONVOLUTA Keferstein (E 79)
Musselwick, March 1956, (UB): Gann, with *Lanice* tubes, September 1948, (UCL); 28.3.48, (RDP): Dale Beach, Slip Pier Beach, 28.3.48, (RDP).

GLYCERA ALBA Rathke
Gann, L.W.N.T. 26.7.54, (det. N. Tebble).

GONIADA MACULATA Oersted
Dale Beach, several in sand sievings, September 1948, (RDP).

Eunicidæ (E 79; Y 153; RY 257)

MARPHYSA SANGUINEA (Montagu) (E 80; Y 152; BY Plate 10)
Musselwick, 28.3.48, (RDP); 28.3.52, (NWM); 25.8.56, (GEB): Gann Flats, March, (JHB); March, 1955, (UB): Dale Sands, 26.7.50, (MRY). Under boulders, in crevices, in muddy sand, up to 15 inches long.

MARPHYSA BELLI (Audouin and M. Edwards)
Gann and Dale Beach, sieved from sand, M.T.L., September 1948, (RDP).

LYSIDICE NINETTA Audouin and M. Edwards (E. 80; BY Plate 10)
Gann Stones, 28.3.48, (RDP): in rock pool, L.W.M., 26.9.49, (UCL).

NEMATONEREIS UNICORNIS (Grube)
Slip Pier Beach, 28.3.48, (RDP).

LUMBRICONEREIS IMPATIENS Claparède
Dale Roads, three, dredged, 17.9.49, (UCL).

Dorvillea (Staurocephalus) rubrovittatus (Grube) var. bivittata (Pruvot and Racovitza)
Gann Stones, under stone in *Fucus serratus* zone, 10.9.50, (JG).

SEDENTARIA The Sedentary Polychaetes (E 64)

Orbiniidæ (E 80 as Ariciidæ)

Orbinia latreilli (Audouin and M. Edwards) (=*Aricia*)
Gann, one, L.W.S.T., 13.8.49, (GO) : Dale Sands, one sieved from sand, 13.4.49, (RDP).

Orbinia cuvieri (Audouin and M. Edwards) (=*Aricia*)
Black Rocks sands, common, L.W.S.T., 28.3.48, (RDP).

Spionidæ (E 81)

Scolelepis fuliginosa (Claparède)
Gann Stones, one in muddy sand, 24.3.56, (UB).

Nerine foliosa (Audouin and M. Edwards) (E 82)
Musselwick, Gann Flats, Dale Beach. Below M.T.L. Common. March, April, August, September.

Nerine cirratulus (Della Chiaje) (E 82)
Castle Beach, one in sand, 22.9.49, (UCL) : common protruding through *Lithophyllum* in rock pools, 27.4.50, (JHB).

Pygospio elegans (Claparède) (E 82)
Gann, March, 1949 ; Watwick, 31.3.49, (NWM).

Polydora ciliata (Johnston) (BY Plate 5)
Angle Bay, April 1953, (UB).

Chætopteridæ (E 83)

Chaetopterus variopedatus (Renier)
Gann Flats, one, 7.3.50, (JHB).

Cirratulidæ (E 84)

Audouinea tentaculata (Montagu) (E 84 as *Cirratulus* ; BY Plate 11)
Gann Stones, Gann Estuary, Gann Flats, Slip Pier Beach. Skokholm—Peter's Bay, Crab Bay. In muddy gravel under stones, M.T.L. and below. March, April, August, September.

Cirratulus cirratus (O. F. Müller) (E 85)
Gann Stones, Dale Beach, Slip Pier Beach, Castle Beach, Monk Haven, Angle Bay. March, April, May, September.

Cirratulus filiformis Keferstein
Watwick Bay, 31.3.49, (NWM).

DODECACERIA CONCHARUM Oersted
Watwick Bay, one, 2.4.54, (UB) : Great Castle Head, two, 26.3.54, (AKC) : SKOKHOLM, one, 11.9.49, (GO). L.W.M. in holdfast of *Laminaria* and in pool in holdfast of *Bifurcaria rotunda*. For asexual reproduction see DW 123.

Chlorhæmidæ (E 85)

FLABELLIGERA AFFINIS Sars (E 85 ; BY Plate 11)
Musselwick, Gann Stones, Gann Flats, Black Rocks, Slip Pier Beach, Dale Fort Beach, Castle Beach, Martin's Haven. Common under boulders and in *Laminaria* holdfasts. Also recorded up to 30 mm. long at Musselwick, Black Rocks, Dale Fort Beach and Martin's Haven from among the spines of *Psammechinus miliaris* (RDP, NWM, JM, UB). This species walks about with its chaetae protruding through a thin mucous tube.

Opheliidæ

AMMOTRYPANE AULOGASTER Rathke
Off Watch House Point, one dredged in fine mud, 3.9.49, (GO).

Capitellidæ (E 85, 86)

NOTOMASTUS LATERICEUS M. Sars (E 86)
Gann Flats and Dale Sands. Common, L.W.M. March, August, September, November.

CAPITELLA CAPITATA (Fabricius) (E 86)
Gann Flats, March 1956, (UB) : Dale Sands, 26.7.50, (MRY).

Arenicolidæ (E 86, 87)

ARENICOLA MARINA L. Lugworm (E 87 ; Y 177, 224 ; RY 52 ; BY Plates 12 and v)
Gann Stones, Gann Flats, Gann Estuary, Gann Saltings, Castle Beach, Angle Bay. SKOKHOLM—Peter's Bay. SKOMER—South Haven. Common and large on the Gann Flats, smaller specimens in the Estuary and Saltings. Not so high up the estuary on 31.3.50 as on 1.4.49 (NWM).

An account of the habits of this species is to be found in New Biology No. 22. It is a burrowing sand eater. It spawns onto the surface of the sand between new and full moon in the second half of October. The eggs, lying on the sand, hatch in 4–5 days and at 14 days the active, but never planktonic, larvæ reach the gravelly *Fucus* zone and live in mucous tubes. They migrate actively to the sandy shore and also migrate frequently thereafter so that the larger specimens are to be found lowest on the shore. They grow to 4.3 cm. long in one year (with no tail region) and spawn at 2 years. After spawning 40 per cent. die. Females outnumber males by nearly 4 to 1.

ARENICOLA GRUBII Claparède (=*branchialis*) (E 87)
Gann Stones, Dale Beach, Castle Beach, Gunkel. SKOKHOLM—Peter's Bay, Crab Bay, South Haven. SKOMER—North Haven. In mud, rare. March, April, September.

ARENICOLA ECAUDATA Johnston (E 87 ; BY Plate 12)
SKOKHOLM—North Haven, two under stones in shell sand, 16.9.54, (HJM).

Maldanidæ

CAESOCIRRUS NEGLECTUS Ardwissen (=*Clymene oerstedii*)
Gann Stones, common in mud, L.W.S.T., 3.4.50, (NWM) : Gann Flats, common, L.W.M., September 1949, (GO) : Dale Beach, 28.3.48, (RDP).

Oweniidæ

OWENIA FUSIFORMIS Della Chiaje (larva H 173)
From Dale Sands to Musselwick, abundant in sand or muddy sand near L.W.S.T. Egg masses attached by an anchoring thread, colourless and about half the diameter of those of *Phyllodoce laminosa*, are possibly of this species, 28.3.48, (RDP).

Sabellariidæ (E 87)

SABELLARIA SPINULOSA Leuckart (E 87)
Musselwick, one, 24.3.51, (NWM) : Gateholm, one, L.W.S.T., 28.3.48, (RDP).

Amphictenidæ (E 88)

PECTINARIA KORENI (Malmgren) (E 89 ; Y 218 ; BY Plates 12 and v)
From Dale Sands to Musselwick, occasional near L.W.S.T. in sand.

PECTINARIA BELGICA (Pallas) (E 89)
SKOMER—North Haven, dredged, April 1946, (UB).

Ampharetidæ (E 88)

MELINNA PALMATA Grube
Lower Gann, 28.3.48, (RDP) ; common in muddy sand, L.W.S.T., April 1949, (GO) : Dale, several, 8.4.55, (JM).

Terebellidae (E 89, 90 ; RY 207)

AMPHITRITE GRACILIS (Grube) (E 91 ; BY Plate 12)
Dale Sands, March 1949, (NWM) : Dale Fort Beach, 26.7.50, (MRY).

AMPHITRITE JOHNSTONI Malmgren (E 91 ; W 51 ; Y 177 ; BY Plate 12)
Gann Flats, March 1955, 1956, (UB).

AMPHITRITE EDWARDSI (Quatrefages) (E 90, DW 140)

Gann Flats from Black Rocks to Musselwick. Common in muddy gravel near L.W.M.

LANICE CONCHILEGA (Pallas) (E 91 ; BY Plate 12)

Common from Dale Sands to Gann Stones. Up to 200 per sq. m. (NAH) ; tubes at upper margin of range empty, 25.3.51, (NWM). Angle Bay, April 1953, (UB). SKOKHOLM—Crab Bay, North Haven ; rare. The tubes are very characteristic (Y 224 ; BY Plate v).

POLYMNIA NEBULOSA (Montagu) (E 91 ; BY Plate 12)

Common under boulders and in *Laminaria* holdfasts in suitable places from Point Wood Beach across the Gann Flats to Musselwick.

NICOLEA VENUSTULA (Montagu) (E 91)

Gann Stones, 28.3.48, (RDP) : Gann Flats, in *Laminaria* holdfasts washed ashore, 11.8.49, (GO) : Slip Pier Beach, 28.3.48, (RDP) : dredged in Dale Roads, 28.3.48, (RDP) ; 17.9.39, (UCL).

NICOLEA ZOSTERICOLA (Oersted) (E 92)

Slip Pier, in *Laminaria* holdfasts from buoy, September 1948, (UCL).

Sabellidæ (E 92, 93)

This family is well represented at Dale, particularly by the extensive beds of *Sabella* and *Branchiomma* on the Gann Flats and in Angle Bay. Many species are tolerant of muddy conditions.

SABELLA PAVONINA Savigny Peacock worm (E 93 ; W 45, 47 ; DW 108 ; Y 241, 244 ; BY Plates 13 and v)

Abundant at and below L.W.N.T. in muddy sand from Black Rocks to Musselwick ; the pale variety with bands across the tentacles is common, the often larger variety with dark red-brown tentacles is less common. Also recorded from Castle Beach (one, 26.7.50, (MRY)) and Angle Bay (common, March 1953, (UB)).

This species, in common with the other Sabellid and Serpulid worms protrudes a cone shaped fan of tentacles from the tube and feeds on suspended particles drawn in on a current produced by the tentacle cilia. *Sabella* is remarkable for its ability to sort the collected particles into three sizes of which the smallest are eaten, the largest are discarded on the upwardly directed outgoing current, and the middle sized particles are mixed with a secretion and used in tube building.

BISPIRA VOLUTACORNIS (Montagu) Twin-fan worm (E 93 ; W 48 ; DW 108 ; Y 244 ; BY Plate 13)

Dale Point, Castle Beach, Gunkel, Great Castle Bay. Small groups found between rocks or in pools near L.W.M. March, April, September.

POTAMILLA RENIFORMIS (O. F. Müller) (BY Plate 13)
Great Castle Head, several tubes tangled around a grey sponge, 11.9.49; Dale Roads, several in a *Clione*-riddled oyster shell, dredged, 16.9.49, (GO).

POTAMILLA TORELLI Malmgren (W 79)
Dale Roads, one, dredged, 17.9.49, (GO): SKOKHOLM—common, L.W.M., 11.9.49, (GO); frequent in encrusting calcareous algae in rock pools below M.T.L., 2.4.52, (ECJ).

CHONE INFUNDIBULIFORMIS Kröyer
Dale, one, 25.3.55, (JM).

BRANCHIOMMA VESICULOSUM (Montagu) (BY Plate 13)
Abundant on the Gann Flats in muddy gravel. Also present at Castle Beach (28.3.48, (RDP)) and Angle Bay (UB). This species is often interspersed with *Sabella* but in more gravelly places. Its tube is coarser than that of *Sabella* (BY Plate v).

DASYCHONE BOMBYX (Dalyell) (E 93; BY Plate 13)
Gann Flats, March 1955, (UB): SKOKHOLM—Peter's Bay, one, L.W.M., 21.7.55, (KST).

FABRICIA SABELLA (Ehrenberg)
SKOKHOLM—North Haven, in crevices, H.W.N.T., 20.8.55, (JG).

ORIDIA ARMANDI (Claparède)
Great Castle Head, numbers attached to a polyzoan, 15.9.49, (GO)

Serpulidæ (E 94)

SERPULA VERMICULARIS L. (BY Plate iv)
SKOKHOLM—South Haven, several, L.W.M., 15.8.47, (CT).

POMATOCEROS TRIQUETER (L.) (BY Plate iv)
Musselwick, Point Wood Beach, Slip Pier Beach, Castle Beach, Gateholm, Angle Bay. SKOKHOLM—Crab Bay, Peter's Bay, North Haven. SKOMER—North and South Havens. Abundant. A common rock shore species, which, unlike most littoral species, is also found in deeper water to 3,000 metres.

PROTULA TUBULARIA (Montagu) (BY Plate iv)
Dale Roads, dredged, common, 17.9.49, (UCL); 31.3.53, (MRY).

APOMATUS sp.
Musselwick Point, several, 28.3.48, (RDP).

SPIRORBIS BOREALIS Daudin (E 96; Y 24, 139; BY Plate iv)
Musselwick, Gann Estuary, Slip Pier Beach, Dale Fort Beach, Castle Beach, Angle Bay. SKOKHOLM—Peter's Bay, Crab Bay. Abundant on stones and weeds near L.W.M.

SPIRORBIS SPIRILLUM (L.) (BY Plate iv)

Slip Pier Beach, Angle Bay. SKOKHOLM—Crab Bay. SKOMER—North and South Havens. On stones and weed near L.W.M.

There are numerous British species of *Spirorbis* and although the above are two common species, others are probably present. In *Spirorbis borealis* eggs are laid at the moon's quarters, when larvæ are liberated and a new batch of oocytes begins to mature. Fourteen days later the eggs (having been retained in the tube) are ready for liberation as free swimming larvæ, the oocytes are ripe and replace them in the tube, and a new batch of oocytes begins to mature. This process if repeated from at least May to October (at Bangor). Thus, numerous larvæ can be obtained for a few days each side of the moon's quarters but only a few in between. The synchronisation with the moon's periods tends to break down in the warmer months.

The larvæ at first swim towards the light but after a period of 15 minutes to 2 hours they begin to wander and tend to swim away from the light. They are attracted to solid surfaces, and particularly to *Fucus*, and explore various places for up to 2 hours. After this they remain on a surface and move more slowly with frequent changes of direction. They eventually secrete a short piece of transparent tube and settle permanently. Subsequent additions to the tube are by means of the special collars for secreting the calcareous tube. The larvæ settle most readily near adults of their own species but are less discriminating if settlement is delayed a few hours.

Class MYZOSTOMARIA

MYZOSTOMUM CIRRIFERUM Leuckart

Gann Stones, 28.9.49, (RDP): March, 1951 and 1952, absent, (NWM). Lives on *Antedon*.

Class OLIGOCHAETA

Tubificidæ

CLITELLIO ARENARIUS O. F. Müller

SKOKHOLM—North Haven, abundant in sand under stones, 25.5.55, (AD).

Class HIRUDINEA Leeches

PONTOBDELLA MURICATA (L.)

Dale Roads, three on *Torpedo nobiliana*, September 1948, (RDP); one on *Raia clavata*, 21.7.49, (GO) : Gann Flats, one on sand, 6.3.50, (JHB)

Phylum **SIPUNCULOIDEA** (E 97)

Golfingia elongatum (Keferstein) (=*Phascolosoma*) (E 98)
In muddy gravel and sandy gravel from Dale Sands to Gann Stones and in Angle Bay. Rare.

Golfingia vulgare (Blainville) (=*Phascolosoma*)
Gann Stones, one in muddy gravel with *Loxosoma*, 28.3.48 ; one, 14.4.49, (RDP).

Golfingia minutum (Keferstein) (=*Phascolosoma*) (E 98)
Slip Pier Beach, one, September 1948, (UCL).

Phascolion strombi (Montagu) (BY Plate 11)
Abundant in dead *Turritella* shells dredged in Dale Roads.

Phylum **ECHIUROIDEA**

Thalassema neptuni Gaertner (E 98)
Skomer—North Haven, one, April 1946, (UB).

Phylum **PRIAPULOIDEA**

Priapulus caudatus Lamarck (E 98 : BY Plate 11)
Gann Flats, one in sand and gravel, 3 inches below surface lying horizontally, L.W.E.S.T., 6.3.54, (JM) : one, March 1955, (UB).

Phylum **ARTHROPODA** (E 14, 102)

Sub-Phylum **CRUSTACEA** (E 103, 104)

Class OSTRACODA (H 161)

There are many bottom living and planktonic ostracods in British waters but they are all small and are largely ignored.

Cythere lutea O. F. Müller
Skokholm—North Haven, in *Laminaria* holdfasts, August 1955, (JG).

Hemicythere villosa (G. O. Sars)
Skokholm—North Haven, in *Laminaria* holdfasts, August 1955, (JG).

Paradoxostoma sp.
Skokholm—North Haven, on *Lomentaria articulata*, August 1955, (JG).

Class COPEPODA (RY 111)

The copepods form a numerous and important group on and in the sea bed (even among sand grains), and among weeds, but being so small they are normally overlooked. In the plankton they are the dominant animal group and numerous species are present. In addition the parasitic copepods are present on and in a variety of hosts. In each case special collecting methods are required and only a few representative species have so far been recorded.

Order EUCOPEPODA

Sub-Order CALANOIDA (W 66 ; RY 121, 128 ; H 157 onwards)

Pontellidæ

Anomalocera patersoni Templeton (H 160, 164)

Dale Roads plankton, three, 31.8.54, (ORB).

Sub-Order HARPACTICOIDA

Ectinosomidæ

Ectinosoma tenuipes T. and A. Scott

Skokholm—North Haven, in *Laminaria* holdfast, August 1955, (JG).

Harpacticidæ

Tigriopus fulvus (Fischer) (=*brevicornis* O. F. Müller)

From Slip Pier Beach round Dale Point to Watwick. Skokholm—Peter's Bay and elsewhere ; Skomer—The Spit. Abundant in pools at, and above, H.W.N.T. Eggs noted in April, May and July. (See *Journ. Mar. Biol. Assoc.* U.K. 36, 1957, 115).

Thalestridæ

Parathalestris sp.

Skokholm—In pool with *Tigriopus*, August 1955, (JG).

Dactylopodia neglecta (G. O. Sars)

Skokholm—North Haven, on *Lomentaria*, August 1955, (JG).

Laophontidæ

Laophonte serrata (Claus)

Skokholm—North Haven, in *Laminaria* holdfast, August 1955, (JG).

Metidæ

Metis ignea Philippi

Skokholm—North and South Havens, in crevices, August 1955, (JG).

Diarthrodes sp.

Skokholm—South Haven, on *Corallina*, August 1955, (JG).

Sub-Order CYCLOPOIDA

Cancerillidæ

CANCERILLA TUBULATA Dalyell

Castle Beach, one on *Amphipholis squamata*, dredged, 16.8.49, (GO).

Lichomolgidæ

MYTILICOLA INTESTINALIS Steuer

A bright red intestinal parasite of the common mussel, *Mytilus edulis* which is having a marked effect on British mussel beds. It appeared in Britain at Blyth in 1947 and has spread rapidly in recent years.

Gann, near Lime Kiln, 2 out of 20 *Mytilus* infected, 5.12.51, (GCB) : present in about 95 per cent. of the mussels in the area from Angle Bay and Dale to Little Milford, Pennar Gut, Lawrenny and Landshipping ; up to 33 parasites per mussel, January 1954, (BTH).

SABELLIPHILUS ELONGATUS M. Sars

Gann Flats, on tentacles of *Sabella pavonina*, August 1953, (VB): (det. J. P. Harding). A rare species previously recorded in 1877 and 1888.

Sub-Order CALIGOIDA

Caligidæ (RY 227)

CALIGUS RAPAX Milne Edwards

Dale Roads, two females with egg sacs, attached to grey mullet (*Mugil chelo*), 14.6.55, (JHB).

CALIGUS PELAMYDIS Kroyer

Dale Roads, one female on mackerel, 30.9.54, (JM).

LEPEOPHTHEIRUS PECTORALIS (O. F. Müller)

Several on gills of dab and flounder (*Pleuronectes limanda* and *P. flesus*), 6.4.49, (RDP).

LEPEOPHTHEIRUS THOMPSONI Baird

One on brill (*Rhombus laevis*), 6.4.49, (RDP).

LEPEOPHTHEIRUS SALMONIS (Kroyer)

Dale Roads, in net off Point Wood Beach, on sewen (*Salmo trutta*), one female, 30.9.54, (JM) ; several with egg sacs, 14.6.55, (J.H.B).

TREBIUS CAUDATUS Kroyer

Dale Roads, on skate in otter trawl ; one, September 1948, (RDP) ; two males and two females on skin near mouth, 21.9.49, (GO).

Sub-Order LERNAEOIDA

Lernæidæ (RH 227)

LERNAEOCERA BRANCHIALIS (L.) (=*Lernaea*)

Young females abundant on gills of flounder (*Pleuronectes flesus*), 6.4.49, (RDP).

Chondracanthidæ

ACANTHOCHONDRIA CORNUTA (O. F. Müller)

Four on gills of flounder (*Pleuronectes flesus*), 6.4.49, (RDP).

ACANTHOCHONDRIA DEPRESSA (T. Scott)

Dale Roads, (RDP).

Lernæopodidæ

CHAROPINUS RAMOSUS Kroyer

Castle Beach, Dale Roads, 28.3.48, (R.D.P.).

Class CIRRIPEDIA Barnacles (E 105)

Order THORACICA

Lepadidæ Stalked barnacles

The species of this family are not local but are washed in alive on floating objects from warmer seas.

LEPAS ANATIFERA L. Ship's barnacle (W 68; RY 210; BY Plate vi)

On several occasions in 1950, (JHB); 24.9.53, (GTJ); 31.7.50, (HJMB). Young specimens were found attached to *Ascophyllum* in Crab Bay, Skokholm on 9.7.56, (CRT).

LEPAS FASCICULARIS Ellis and Solander (W 69; BY Plate vi)

Many, 20.7.50, (JHB). This species occurs in small clusters attached to its own float.

LEPAS PECTINATA Spengler

Gateholm, (RDP).

Verrucidæ (E 106)

VERRUCA STROEMIA (O. F. Müller) (BY Plate vi)

Musselwick, two; Slip Pier Beach, absent; Castle Beach, a few; Gateholm, absent; Martin's Haven, rare, 12.4.49, (RDP). Dale Roads, on back of *Maia squinado*, 31.3.49, (NWM). SKOMER—Mew Stone, common, April 1946, (UB). It breeds in the spring and summer. The genus *Verruca* is a deep-water genus and this species extends from 3000 m. to L.W.E.S.T.

Chthamalidæ (E107; C175; 176; Y272)

CHTHAMALUS STELLATUS (Poli) (BY Plate vi)

Abundant on all exposed rocky shores from above H.W.M. to M.T.L. and below. Absent in shelter (e.g. Musselwick Point, Castle Beach and Gateholm (West), 28.3.48, (RDP)). Rare specimens occur near the Gann (2.8.49, NWM) and large specimens were recorded from the *Laminaria* zone in Crab Bay on Skokholm (17.9.54, HJM). It is a southern form and breeds in the summer months. Its distribution in Great Britain is apparently limited to the west coast by winter temperatures.

Balanidae Acorn Barnacles (E107; Y110; 113; H165)

BALANUS BALANUS L. (=*B. porcatus*) (Darwin 1854, *II*, p. 256)

Musselwick Point, a few, L.W.M., 28.3.48, (RDP) ; March 1955, (UB) : Slip Pier Beach, a few, 28.3.48, (RDP).

This northern species is a sub-littoral form and is a winter breeder liberating its nauplii in February. It is cross fertilised and isolated specimens do not breed.

BALANUS CRENATUS Brugière (BY Plate vi)

The commonest barnacle on sub-littoral stones, shells and crabs. Often found near L.W.M. It has been recorded from Musselwick, Slip Pier Beach, Castle Beach, Gateholm and Dale Roads ; and on Skokholm from Crab Bay and South Haven.

It breeds through the spring and summer liberating a large batch of nauplii in March and smaller numbers throughout the summer. Newly settled spat was recorded from Castle Beach, 29.5.49, (JHB).

BALANUS PERFORATUS Brugière (BY Plate vi)

The largest shore barnacle, occurring in crevices on overhanging surfaces on exposed shores. This mediterranean species occurs only in the south west (of Great Britain) and has, strangely enough, not been recorded from Ireland. It breeds in the summer months. It occurs commonly from Point Wood Beach round Dale Point to Castle Beach, is rare on Great Castle Head but common on Gateholm. It is common in parts of Skokholm and Skomer.

BALANUS BALANOIDES (L.) (BY Plate vi)

The commonest British barnacle girdles the whole of the British Isles from about H.W.N. to M.T.L., often extending towards L.W.M. It is a northern form and breeds during the winter liberating its larvæ mainly in March ; settlement occurring in April. It occurs lower on the shore than *Chthamalus* but extends further into shelter and is found in Dale Bay right up to the Gann Mouth. It is frequently infected with an isopod parasite *Hemioniscus balani*.

BALANUS IMPROVISUS Darwin

Recorded only from Skomer (the Basin) this species, typical of L.W.M. in estuaries and sheltered bays, probably occurs in the area. Its status requires investigation and the Skomer record requires confirmation.

BALANUS HAMERI (Ascanius) (Darwin, Cirripedia, 1854, 277)

This large, sub-littoral species is a northern form with a life history similar to that of *B. balanus*. The sole record from the area is a single record-sized specimen from a crab pot off the Smalls (2.6 inches basal diameter and 1.35 inches high—det. J. P. Harding) 24.10.50.

ELMINIUS MODESTUS Darwin (BY Plate vi)

First recorded at Dale in September 1951 (UCL) the species is now abundant in Dale Bay from Dale Point to Musselwick. Occasional specimens have been seen outside e.g. Gunkel, one, 5.7.52 (EMT) ; Dale Point, two, March 1955 ; Angle Bay, April 1953 (UB). It occurs from L.W.M. to H.W.M. and may be found among *B. balanoides* and *Ch. stellatus* at all levels. It breeds throughout the year, but at a low rate during winter, and during summer a generation may occupy only 8 weeks.

The species arrived in this country from New Zealand in 1943 or 1946 and has subsequently spread from the English Channel to the Scottish borders along both east and west coasts. It was originally thought that it would compete mainly with *Balanus improvisus* since their habitat is similar. However, it seems to be competing with other species as well and, in addition, to be occupying areas previously uncolonised by barnacles. For example, at Dale, it is the only barnacle found on dog whelks.

An interesting feature of barnacle distribution is that *Balanus perforatus* does not occur in S.W. Ireland, which should be suited to it, nor *Elminius modestus* on Guernsey although it has been present on the adjacent French coast for some years. It is usually assumed that shore animals with planktonic larvæ must lose a considerable number of their young by dispersal seawards. These two observations suggest that the loss may not be excessive.

Order RHIZOCEPHALA

These remarkable parasitic barnacles feed by an absorptive ‘ root ’ system which ramifies throughout the tissues (except heart and gills) of their decapod hosts. In some hosts this produces ‘ parasitic castration ’. The external part bears no resemblance to a barnacle (nor indeed to any other crustacean) but the larvæ are typical nauplii which give rise to a typical Cirripede cypris larva, which then attacks and penetrates the host. The larvæ do not feed and in some species the eggs hatch at the cypris stage.

Sacculinidæ

SACCULINA CARCINI Thompson (BY Plate vi)

Common on shore crabs (*Carcinus maenas*) from the sub-littoral in Dale Roads, and one from Angle Bay.

PELTOGASTER PAGURI Rathke (BY Plate vi)

Slip Pier Beach, one on *Eupagurus bernhardus*, 28.3.48, (RDP).

Class MALACOSTRACA

The Malacostraca, including as it does the very numerous species of amphipods, isopods, shrimps, prawns and crabs, is the most varied of the crustacean groups and is important to the shore collector as many of the species are large. Development is often direct and in others the eggs very rarely hatch in so early a stage as the typical crustacean nauplius—the crab zoea is a much more developed larval stage.

Sub-Class LEPTOSTRACA (E 108)

NEBALIA BIPES (Fabricius) (BY Plate viii)

This interesting species with its mixture of primitive and specialised features is characteristic of L.W.M. on the rocky shore where mud accumulates among gravel and sand in crevices and pools. It is common at the Gann Stones and has been recorded from Angle Bay and from Crab Bay on Skokholm. It is a filter feeder, using its thoracic appendages for this purpose.

Sub-Class PERACARIDA

Order CUMACEA (BY Plate xiii)

Bodotriidæ

BODOTRIA SCORPIOIDES (Montagu)

Plankton, at night, males only, 12.9.54, (GTJ).

IPHINOE TRISPINOSA (Goodsir) (BY Plate xiii)

Plankton, night, 21.9.52, (GTJ).

Diastylidæ

DIASTYLIS RATHKEI (Kroyer)

Dale Sands, (RDP).

Order TANAIDACEA (E 109)

Apseudidæ

APSEUDES TALPA (Montagu) (E 109)

Dale Fort Beach, one in *Laminaria* holdfast, 26.3.56 : SKOMER—North Haven, one, April 1946, (UB).

Tanaidæ

TANAIS CHEVREUXI Dollfus

SKOKHOLM—North and South Havens, abundant in crevices, August 1955, (JG).

TANAIS CAVOLINI Milne Edwards (BY Plate xiii)

Slip Pier, one in *Cladophora*, 22.3.56, (UB).

Order ISOPODA (E 109, 110)

Anthuridæ

ANTHURA GRACILIS (Montagu)
Dale Roads, dredge, one, September, 1948, (RDP).

Anceidæ

PARAGNATHIA FORMICA (Hess) (Bate and Westwood, 1868, *ii*, 203, as *Anceus haladaii* Halliday)
Dale, September 1951, (UCL).

Gnathiidæ (E 113)

GNATHIA MAXILLARIS (Montagu) E 113; H 169; BY Plate viii)

This ectoparasitic species has easily distinguishable males and females and larval stages. The adults live in crevices,or burrows on the shore and reproduce but do not feed. Development is direct and the praniza larva—the feeding stage—attacks fish and sucks blood.

Females have been taken at Castle Beach (one) and Longoar Bay (eleven); males at Longoar Bay (one); praniza larvæ at Slip Pier Beach (one on *Blennius ocellaris*), Point Wood Beach (one on a blenny), Dale Roads (one in dredge) and South Haven, Skomer (three on a rockling).

Cirolanidæ (E 114)

CIROLANA CRANCHI Leach (E 114)
Brig Stones, one (probably washed up), 21.9.53, (EMS).

EURYDICE PULCHRA Leach (E 114, BY Plate viii)
Watwick Bay, in sand just below H.W.N.T., 27.4.48, (NAH): Great Castle Head, 26.7.50, (MRY): West Dale Bay, in pool, M.T.L., 5.3.55, (JM): Marloes Sands, abundant in pools, H.W.N.T., 25.3.49, (DWS).

EURYDICE SPINIGERA Hansen
Plankton, 25.8.53, (det. I. Gordon), (JHB).

Limnoriidæ (E 114)

LIMNORIA LIGNORUM (Rathke) (E 114; Y 174, 184–186; RY 144–145; BY Plate viii)

Common in the wood of a wreck at Musselwick, 1948 onwards. A wood-boring animal of economic importance as it eats away wooden piles, etc.

Sphæromatidæ (E 115)

SPHAEROMA SERRATUM (Fabricius) (E 115)

Occasional in brackish pools on the Gann Saltings, in pools and crevices at Black Rocks, Point Wood Beach and Castle Beach.

Sphaeroma rugicauda Leach (E 115; BY Plate viii)
A species with a brackish water habit. Abundant in the Gann Saltings pools to above Mullock Bridge, and in the Castle Beach stream at H.W.S.T.

Cymodoce truncata (Montagu)
Off Stack Rock, one, dead, dredged, 18.9.53; Dale Beach, in *Laminaria* holdfasts cast up by storm, 22.9.53, (EMS).

Dynamene bidentata (Adams) (=*Naesa*) (E 115; BY Plate viii)
Dale Fort Beach, several, March and July, 1949, (NWM): Castle Beach, one L.W.S.T., 11.4.49, (RDP); several females, 8.4.50, (RG); four in crevice, H.W.M., 23.3.56, (UB): Stack Rock, one male, one female, 25.9.53, (EMS). Skokholm—South Haven, in crevices, 3.8.50, (HJMB); August 1955, (JG): Crab Bay, occasional, 14.9.54, (HJM).

Campecopea hirsuta (Montagu)
West Dale, abundant in *Pygmaea pumila* with *Littorina neritoides* and *Lasaea rubra*, 11.3.56, (JM): Skokholm—Peter's Bay, abundant in crevices, August 1955, (JG).

Idoteidæ (E 112)

The systematics of the genus *Idotea* has been clarified by Naylor, E. (Journ. Mar. Biol. Assoc. U.K. *34*, 467–494, 1955).

Idotea baltica (Pallas) (E 112; BY Plate vii)
Point Wood Beach, Slip Pier Beach and buoy nearby, Castle Beach, Great Castle Head, Angle Bay. Skokholm—Crab Bay, Peter's Bay, Dumbell Bay, and South Haven. Common among *Pelvetia*, *Fucus spiralis* (DWS), *Laminaria* holdfasts (UCL) and red weeds, (JHB). March, June, September.

Idotea emarginata (Fabricius) (E 112, BY Plate vii)
Great Castle Head, 26.7.50, (MRY): Skokholm—Peter's Bay, 21.7.55, (KST).

Idotea granulosa Rathke (E 113, BY Plate vii)
Dale Beach, 20.11.48, (NWM). Skokholm—Crab Bay, 23.4.52, (KJM): Peter's Bay, several, 21.7.55, (KST): North Haven, on *Corallina*, August 1955, (JG).

Idotea chelipes (Pallas) (E 113 as *viridis*, BY Plate vii)
Gann Saltings, 24.3.49, (DWS): Slip Pier Beach, 20.4.49, (RG). Skokholm—Peter's Bay, several, L.W.M., 1.7.55, (KST).

Idotea pelagica Leach (E 112)
Buoy off Slip Pier Beach, in *Laminaria* holdfasts, September 1948, (UCL): Great Castle Head, 26.7.50, (MRY). Skokholm—Peter's Bay, one, 12.4.48, (BW).

IDOTEA LINEARIS (L.) (E 113; BY Plate vii)
Musselwick, one, 26.3.52, (NWM): Dale Sands, one male, one female, in pool, L.W.S.T., 14.4.49, (RDP).

Arcturidæ

ARCTURUS (Latreille) sp.
Gann Flats, one on weed, 23.9.49, (UCL): Dale Roads, one in dredge, 16.9.49, (GO).

ASTACILLA LONGICORNIS (Sowerby)
Gann Flats, 24.9.50, (EMS); one male, L.W.S.T., 4.10.56, (JM).

ARCTURELLA DAMNONIENSIS (Stebbing)
Stack Rock, one breeding female, on sponge with *Plumularia setacea*, L.W.S.T., 25.9.53, (EMS).

Janiridæ (E 110)

JANIRA MACULOSA Leach (E 110)
Stack Rock, one male among sponges and hydroids, L.W.S.T., 25.9.53, (EMS). SKOMER—South Haven, one, April 1946, (UB).

JAERA ALBIFRONS Leach (E 111 as *marina*, BY Plate vii)
A species characteristic of places where fresh water flows over the beach. Often found with *Procerodes ulvae*.

Gann Flats, Gann Estuary (Mullock Bridge), Dale Beach (in fresh water flow), Slip Pier Beach, Dale Fort Beach. SKOKHOLM—North Haven, H.W.N.T. to L.W.N.T. March, April, August, November. In berry, 28.4.50.

JAERA NORDMANNI (Rathke) (E 111)
SKOKHOLM—South Haven, in crevices, H.W.M., 31.7.50, (HJMB).

Munnidæ (E 111)

MUNNA LIMICOLA G. O. Sars
Stack Rock, one among sponges and *Plumularia setacea*, 25.9.53, (EMS).

Ligiidæ

LIGEA OCEANICA (L.) Sea slater (E 111; Y 28; BY Plate vii)
Common near and above H.W.M. on all rocky coasts, (and right up to the cliff top at Mad Bay on Skokholm).

Bopyridæ

BOPYRUS FOUGEROUXI (Giard and Bonnier) (=*B. squillarum*)
Dale Roads, one on *Leander* in trawl, 1.9.49, (GO). This pale green parasite lives in the gill chambers of prawns and is called colloquially ‘face-ache’.

Cryptoniscidæ

HEMIONISCUS BALANI (Spence Bate) (E 116)

Slip Pier, one in 20 *Balanus balanoides*, H.W.M., 28.3.48, (RDP); one, September 1948, (UCL); three, 3.4.49, (RDP). SKOMER—South Haven, common; North Haven, rare; Midland Isle, rare, April 1946, (UB).

Parasitic in the mantle cavity of *Balanus balanoides*. Infection rates are very variable and have ranged up to 100 per cent. in some places on British coasts.

Order AMPHIPODA (E 116, 117)

The amphipods are extremely numerous both in species and individuals in a wide variety of marine and brackish environments. They are detritus feeders, scavengers of plant and animal remains, and also scrape diatom films, etc. Many have specialised habitats.

Sub-Order GAMMARIDEA

Lysianassidæ

LYSIANASSA CERATINA A. O. Walker

SKOKHOLM—Hog Bay, L.W.M. in shingle, 27.3.52, (ECJ).

ORCHOMENELLA NANA (Kroyer) (BY Plate ix)

Brig Stones, 28.8.50, (det. I. Gordon); Dale Beach and Gann Flats, at least a dozen occasions, July, August, 1953, (JHB). Common in cast skeletons of *Carcinus maenas*.

Ampeliscidæ

AMPELISCA BREVICORNIS (A. Costa)

Gann Flats, Dale Beach, 28.3.48, (RDP); occasional up to 8 mm. long, in sand with shingle, L.W.S.T., 17.11.55, (AD).

Haustoriidæ (E 120; BY Plate ix & x)

BATHYPOREIA PELAGICA (Bate) (Y 242, zonation; BY Plate ix)

Marloes Sands, one in sand between rocks covered with *Porphyra*, L.W.N.T., 13.11.55, (AD).

UROTHOE BREVICORNIS Bate

Dale Beach, one in sand with fine pebbles, 17.11.55, (AD).

Leucothoidæ

LEUCOTHOE sp. (? *incisa* D. Robertson)

Gann Flats, one in shingly sand, 17.11.55, (AD).

Stenothoidæ

STENOTHOE MONOCULOIDES (Montagu)

Castle Beach, several in rock pool, H.W.N.T., 26.3.49, (DWS). SKOKHOLM—Peter's Bay, in *Laminaria* holdfasts, 11.5.56, (AD).

Calliopiidæ

APHERUSA BISPINOSA (Bate)

Marloes Sands, one female on *Porphyra*, L.W.N.T., 13.11.55, (AD)

APHERUSA JURINEI (Milne Edwards)

Marloes Sands, common, 3 mm. long, on *Corallina* in pool among boulders, L.W.N.T., 13.11.55, (AD). SKOKHOLM—North Haven, Crab Bay, Hog Bay ; on *Gigartina*, *Himanthalia* and in *Laminaria* pools ; L.W.S.T. ; September, October, 1955 : North Haven, on *Laminaria*, 11.4.56, (AD). Breeding, September, October, (AD).

CALLIOPIUS CRENULATUS Chevreux and Fage (=*laevusculus*)

SKOKHOLM—North Haven, Crab Bay, Hog Bay, on weed and in pools ; L.W.S.T. ; September, October, 1955 ; Peter's Bay, under stones on muddy shingle, L.W.S.T., 26.4.56, (AD). Breeding, September, (AD).

Atylidæ

NOTOTROPIS SWAMMERDAMI (Milne Edwards) (BY Plate ix)

Dale Beach, in loose weed on muddy sand with *Gammarus locusta*, 17.11.55, (AD). SKOKHOLM—North Haven, Crab Bay, Peter's Bay, on *Himanthalia*, *Laminaria* etc. ; L.W.S.T. ; September, October, 1955 (AD) ; Peter's Bay, in muddy shingle, L.W.S.T., 26.4.56, (AD). Breeding, April, September, (AD).

Gammaridæ (E 117)

The standard amphipod work by Chevreux and Fage is no longer adequate for the genera *Gammarus* and *Marinogammarus*, and even Reid's more recent key is out of date for some species. Some of the older records given here require confirmation.

GAMMARELLUS HOMARI (Fabricius)

Slip Pier Beach, West Dale Bay, Marloes Sands, Dale Roads. SKOKHOLM—North Haven, Crab Bay, Wreck Cove. Occasional near L.W.M. and below. In pools, in sand, on *Corallina*, *Porphyra* and *Laminaria*. Breeding, March and September.

MELITA PALMATA (Montagu)

Gann Saltings, Gann Mouth, West Dale Bay. SKOKHOLM—North Haven, South Haven, Peter's Bay, Hog Bay, Crab Bay. Occasional, L.W.M. In pools, among weed and in shingle. March, April, September.

MELITA HERGENSIS Reid

SKOKHOLM—All bays with *M. palmata*, (confirmed by D. M. Reid), September 1955, (AD).

MAERA OTHONIS (Milne Edwards)

Off Dale Fort, dredged in 12 fathoms, 23.3.49, (DWS).

GAMMARUS LOCUSTA (L.) (E 188, BY Plate ix)

Gann Saltings, 29.3.49, (DWS) : Dale Beach, small specimens common in loose weed on muddy sand, with *Nototropis swammerdami*, L.W.M., 17.11.55, (AD) : Castle Beach, (RDP). SKOKHOLM—Crab Bay, L.W.S.T. ; North Haven, one ; September, October, 1955, (AD).

GAMMARUS ZADDACHI Sexton

Gann Estuary, below Mullock Bridge, 29.3.49, (DWS) : Gann Saltings, several, 8.4.49, (RDP) : the sub-species *G.z. zaddachi* Spooner, common on seaweed among mussels and in crevices from Little Milford to Mill Bay, (BTH). SKOKHOLM—abundant in a brackish pool above H.W.S.T. on the cliffs west of Frank's Point, 1.4.52, (ECJ) ; absent in 1955 (AD). An estuarine species with several varieties.

GAMMARUS DUEBENI Lilljeborg

Marloes Sands, in stream above H.W.S.T., 25.3.49, (DWS) : SKOKHOLM—in stream at Hog Bay, 24.3.52, (EJ) ; stream at South Haven and Orchid Stream, 21.9.55, (AD) ; stream at Tabernacle, August 1955, (JG) ; East stream, 15.5.56, (JG) ; in brackish pools above H.W.M. around coast, 1955, (AD). A brackish and freshwater species.

MARINOGAMMARUS MARINUS (Leach) (E 117)

Gann Estuary, from mouth upwards for several hundred yards: Slip Pier Beach. SKOKHOLM—common or abundant, H.W.N.T. to L.W.M., Crab Bay, Little Bay, Peter's Bay, North Haven, South Haven. March, April, July, August, September.

MARINOGAMMARUS OBTUSATUS (Dahl)

Slip Pier Beach, Castle Beach. SKOKHOLM—Hog Bay, Crab Bay, North Haven, South Haven, Peter's Bay. Common, M.T.L. to L.W.S.T., under stones, in *Laminaria* holdfasts. Commoner than *M. marinus* at L.W.M. on Skokholm. Breeding, March, April.

MARINOGAMMARUS FINMARCHICUS (Dahl)

Slip Pier Beach. SKOKHOLM—South Haven, Peter's Bay, Hog Bay. Common, under stones and in shingle, M.T.L. to L.W.S.T.

MARINOGAMMARUS STOERENSIS (Reid)

Marloes Sands, in pools at H.W.N.T. where stream flows in, 25.3.49, (DWS). SKOKHOLM—Hog Bay, pool with fresh water, H.W.N.T., 23.3.52, (JG) ; 15.4.56, (AD) : North Haven, 15.4.56, (AD). A species characteristic of H.W.M. where fresh water flows onto the beach.

Dexaminidæ

DEXAMINE SPINOSA (Montagu)

Dale Beach, occasional, up to 5 mm. long, in sand and on loose weed, L.W.M., 17.11.55, (AD).

DEXAMINE THEA Boeck

SKOKHOLM—Peter's Bay, common under stones on muddy shingle, L.W.S.T., 26.4.56; North Haven, in *Laminaria* holdfasts, 11.4.56, (AD). Breeding, April, May, (AD).

Talitridæ Sand-hoppers (E 118)

TALITRUS SALTATOR (Montagu) (E 118; Y 28; BY Plate ix)

Dale Beach, in weed litter, H.W.M., 4.10.55, (AD): Slip Pier Beach, Castle Beach, September 1948, (UCL). SKOKHOLM —North Haven, 1.8.47, (MHW); absent, 1955, (AD).

ORCHESTIA MEDITERRANEA A. Costa

Dale, March 1949, (DWS).

ORCHESTIA GAMMARELLA (Pallas) (E 118, BY Plate ix)

Gann Estuary, Dale Beach, Slip Pier Beach, Castle Beach, West Dale Bay. SKOKHOLM—all round. SKOMER—North and South Havens. MIDLAND ISLE—west end. In weed litter under stones and in mud: also from brackish pools and in streams. From H.W.M. to the cliff tops on Skokholm wherever damp, and at the mouth of a rabbit burrow 150 feet above sea level on Midland Isle.

TALORCHESTIA DESHAYESEI (Audouin)

Dale Beach, males, females and immatures in weed litter and underlying sandy shingle, H.W.M.; with *Orchestia gammarella* and *T. saltator*, 4.10.55; with *T. saltator* 7.11.55, (AD).

The sand hoppers feed at night and shelter in the sand or seaweed debris by day. In an Australian species this rhythm has been shown to be controlled by light so that by suitable illumination the times of feeding and resting can be reversed: but an internal rhythm is also involved since in complete darkness the diurnal rhythm is maintained for several days.

Some species have a ' compass ' reaction so that if displaced landwards they will migrate seawards on the compass bearing appropriate to their own coastline. But if transported to a coastline of the ' wrong ' direction their movement is still in the same compass direction and will not take them back to the strange shore.

HYALE NILSSONI (Rathke)

Marloes Sands, frequent at H.W.N.T., in pools where stream flows, and on rocks at L.W.N.T. with mussels and barnacles. SKOKHOLM—widespread at M.T.L. on *Fucus*, green algae and in crevices. Breeding, May, September, October.

HYALE PONTICA Rathke

SKOKHOLM—South coast, west of Frank's Point. Common in pools below M.T.L., 1.4.52, (ECJ) ; not found, 1955, (AD).

HYALE PERIERI (Lucas)

SKOKHOLM—South coast and Wild Goose Bay, rock faces, L.W.M., and in pool, M.T.L. (confirmed by D. M. Reid), September 1955 ; Crab Bay rocks, 1956. Breeding, May, (AD).

Aoridæ

AORA TYPICA Kroyer

Gann Flats, one male 4 mm. long, one female 3 mm. long, in *Laminaria* holdfast with annelids, 17.11.55, (AD).

LEMBOS WEBSTERI (Bate)

SKOKHOLM—Peter's Bay, two, 11.5.56 ; Hog Bay, breeding, 7.9.56 ; in *Laminaria* holdfasts, (AD).

Amphithoidæ (E 118)

AMPHITHOE RUBRICATA (Montagu) (E 119 ; BY Plate ix)

Black Rocks, Dale Beach, Dale Fort Beach, Castle Beach, West Dale Bay, Dale Roads (dredged in 12 fathoms). Rare. L.W.M., lives in a tube under rocks and on weeds ; often in pools.

PLEONEXES GAMMAROIDES Bate

SKOKHOLM—North Haven, on *Himanthalia*, L.W.S.T., October 1955, (AD).

Jassidæ

The Jassids live in tubes attached to weeds and are common on *Laminaria*.

JASSA FALCATA (Montagu) (BY Plate x)

SKOKHOLM—North Haven, Crab Bay, Hog Bay, on weed, L.W.N.T. to L.W.S.T. ; September, October, 1955 ; North Haven, on *Laminaria*, 11.4.56, (AD).

PARAJASSA PELAGICA (Leach)

Dale Roads, one, trawled, April, (det. I. Gordon), (JHB).

Corophiidæ (E 119)

ERICHTHONIUS BRASILIENSIS (Dana)

Gann Flats, L.W.M., 28.3.49, (DWS) : Dale Beach, one in sand with shingle, L.W.S.T., 17.11.55, (AD).

COROPHIUM VOLUTATOR (Pallas) (E 119, BY Plate x)

Gann Saltings and Estuary, abundance varies from year to year. A common saltmarsh and estuarine, mud-living, species inhabiting a small U-shaped burrow. Yonge (p. 256) describes feeding.

Cheluridæ

CHELURA TEREBRANS Philippi (Y 186 ; BY Plate vii)
Gann Stones, in wreck with *Linnoria lignorum*, 10.4.49, (RDP) : Dale Beach, in drift wood, 22.9.53, (EMS).

Sub-Order HYPERIIDEA

Hyperiidæ

HYPERIA GALBA (Montagu) (H 167 ; BY Plate x)
In stomach and radial canals of *Rhizostoma pulmo*, 16.6.50, (JHB) and 22.3.56, (AD).

Sub-Order CAPRELLIDEA

Caprellidæ Skeleton shrimps (E 119 ; W 65 ; Y 76 ; RY 61)

PHTISICA MARINA Slabber
Dale Roads, one on red weed, sub-littoral, 17.9.53, (EMS).

PSEUDOPROTELLA PHASMA (Montagu)
Musselwick, (RDP).

CAPRELLA ACANTHIFERA Leach
Slip Pier Beach, Great Castle Head, Martin's Haven, Stack Rock. SKOKHOLM—Hog Bay, Crab Bay. Occasional, L.W.S.T. In *Laminaria* holdfast, on *Plumularia setacea* and other hydroids. March, July, August, September. Breeding, September.

CAPRELLA LINEARIS (L.) (BY Plate x)
Dale, September 1951, (UCW).

CAPRELLA FRETENSIS Stebbing
Stack Rock, one breeding female on *Plumularia setacea* on sponge, L.W.S.T., 25.9.53, (EMS).

Order SCHIZOPODA (=Mysidacea, E 121)

Mysidæ

The delicate mysids are detritus and filter feeders which swim by means of their thoracic expodites close to the bottom, often rising into the plankton at night. Some species occur in vast numbers at the edge of the tide on estuarine banks.

SIRIELLA ARMATA (Milne Edwards) (E 122)
Mill Bay, one male in pool, 18.9.52, (EMS and GTJ).

SIRIELLA JALTENSIS Czerniavsky
In pools. Slip Pier Beach, one, 28.3.48, (RDP) : Mill Bay, several, 18.9.52, (EMS and GTJ).

LEPTOMYSIS LINGVURA (G. O. Sars)
Mill Bay, several in pools, 18.9.52, (EMS and GTJ).

SCHISTOMYSIS SPIRITUS (G. O. Sars) (E 122)
Plankton, common in night haul, 27.9.50, (EMS). Gann Flats, water's edge, March 1955, (UB).

PRAUNUS FLEXUOSUS (Müller) (E 122 ; Y 29 ; H 166)
Black Rocks and Gann Flats, common at water's edge, 20.9.52, (GTJ).

NEOMYSIS INTEGER (Leach)
Pickleridge lagoons, abundant, 8.4.49, (RDP) : Gann Estuary, April 1949, (NWM).

Order DECAPODA Crabs, prawns, shrimps, lobsters, hermit-crabs (E 123–5 ; larvæ H 170, 171)

Sub-Order NATANTIA Prawns, shrimps.

Tribe CARIDEA

Hippolytidæ (E 125)

HIPPOLYTE VARIANS Leach (E 126 ; RY 180, 182)
Black Rocks, one in sand, 28.3.48, (RDP) : Gann Stones, common in pools, 28.3.48, (RDP) ; 23.9.49, (UCL). This is the small prawn famous for its ability to change colour.

SPIRONTOCARIS CRANCHI (Leach) (E 126)
Musselwick Point, in pools, L.W.S.T., 28.3.48, (RDP).

Alpheidæ (E 126)

ATHANAS NITESCENS (Montagu) (E 126 ; Y 108 ; BY Plate xi)
Occasional. Musselwick, Castle Beach, Martin's Haven, SKOMER—North Haven. In berry, 7.8.56, (JHB).

Palæmonidæ (Prawns, E 126)

PALAEMON SERRATUS (Pennant) (=*Leander*, E 127 ; W 62 ; DW 46 ; Y 93 ; RY 317, 335 ; BY Plate xi)
Common in Dale Bay (Musselwick, Gann Mouth, Dale ; Dale Roads) : up to 5 inches, 19.7.51, usually 2½ inches. Angle Bay. March, April, June, July, August. In berry, 15.6.50, 20.8.52, (JHB).

PALAEMON ELEGANS Rathke (=*Leander squilla*, E 127 ; Y 76, 77, 96)
In rock pools. Musselwick, Gann Flats, Slip Pier Beach, Castle Beach, Great Castle Head. SKOKHOLM—South Haven, Crab Bay, Peter's Bay. SKOMER—North Haven. March, July, August, September.

PALAEMONETES VARIANS (Leach) (BY Plate xi)
Gann Estuary and Saltings. Common. March, April, August, September, November. A brackish water species.

Crangonidæ (E 127)

CRANGON VULGARIS Fabricius Common shrimp (E 127; Y 29, 241; RY 317, 335; BY Plate xi)

From Gann Stones to Black Rocks and in the Gann Estuary up to Mullock Bridge. In sand and pools. The species has a tolerance for reduced salinity, particularly in summer.

PHILOCERAS FASCIATUS (Risso)

Musselwick, L.W.M., 23.9.53, (GTJ): Dale, September 1951, (UCW).

Sub-Order REPTANTIA Lobsters, hermit-crabs and crabs.

Tribe PALINURA

Palinuridæ (E 127)

PALINURUS VULGARIS Latreille Crawfish, spiny- or rock-lobster (E 127; RY 133, 316, 326; H 170; BY Plate 14)

Common in lobster pots, 1950, (JHB).

Tribe ASTACURA

Nephropsidæ (E 128)

NEPHROPS NORVEGICA (L.) Norway prawn or lobster (W 53; RY 316, 321)

Abundant in trawls beyond the Smalls, 28.8.51, (JHB).

HOMARUS VULGARIS Milne Edwards Lobster (E 128; DW 78; Y 100; RY 314, 321; BY Plate 14)

Common in lobster pots. 1951 was a bad year, (JHB).

Tribe ANOMURA

Galatheidæ (E 128-9) Squat-lobsters

GALATHEA INTERMEDIA Lilljeborg

Dale Roads, one in dredge, 28.8.56, (GEB).

GALATHEA SQUAMIFERA Leach (E 129; RY 38; BY Plate 14)

Musselwick, rare; Point Wood Beach, common; Castle Beach and Great Castle Head, rare. In berry, 7.3.50, 3.4.50, (JHB).

GALATHEA STRIGOSA (L.) (E 129; Y 101; BY Plate 14)

Musselwick Point, one, L.W.O.S.T., 28.3.48, (RDP). SKOMER—Mew Stone, one, April 1946, (UB).

Porcellanidæ (E 130)

The two porcelain crabs are filter-feeding species.

PORCELLANA PLATYCHELES (Pennant) (E 130; Y 31; BY Plate 14)

Very common under boulders near L.W.M. Musselwick Point, Gann Stones, Point Wood Beach, Slip Pier Beach, Dale

Fort Beach, Castle Beach, Martin's Haven, Angle Bay. SKOKHOLM—Crab Bay, Peter's Bay, Little Bay, South Haven. SKOMER—North Haven, South Haven, Mew Stone. March, April, June to September. Absent at Brig Stones, 11.4.49, (JHB). In berry, April, June.

PORCELLANA LONGICORNIS (L.) (E 130 ; W 123 ; RY 253 ; H 165 ; BY Plate 14)

Not so common as *P. platycheles*. Under boulders near L.W.M. Musselwick Point, Gann Stones, Brig Stones, Point Wood Beach, Slip Pier Beach, Castle Beach, Gateholm, Angle Bay, Dale Roads (trawled). SKOKHOLM—Crab Bay, Peter's Bay. SKOMER—North Haven, South Haven and Mew Stone. This species is commoner at Musselwick Point than *P. platycheles* but less common in most other places. At the Brig Stones it disappears where mud gives way to sand and gravel.

Tribe THALASSINIDEA

Callianassidæ Burrowing prawns (E 130)

CALLIANASSA (CHERAMUS) SUBTERRANEA (Montagu) (E 131 ; Y 252)

Brig Stones, one in mud of rock pool, L.W.S.T., 3.4.54, (UB).

Tribe PAGURIDEA

Paguridæ Hermit-crabs (E 131)

EUPAGURUS BERNHARDUS (L.) (E 131 ; W 61 ; DW 136 ; Y 30, 163 ; BY Plate 15)

Not uncommon. Musselwick Point, Gann Flats, Black Rocks, Point Wood Beach, Slip Pier Beach, Castle Beach, Gateholm, Dale Roads (trawled), Angle Bay. SKOMER—South Haven, North Haven (dredged). A specimen from the Slip Pier Beach had *Peltogaster*, (RDP).

Most intertidal specimens are small but full grown specimens of this species form the basis of a very interesting association. The crab occupies an empty whelk shell (*Buccinum undatum*), to which may be attached a variety of ordinary rock-living barnacles, tube worms or hydroids ; but in addition there may be more specific associates :—the anemone, *Calliactis parasitica* ; the worm, *Nereis fucata* (within the shell) ; the hydroid, *Hydractinea echinata*, or occasionally, *Podocoryne cornea*, (instead of the anemone) ; and the barnacle, *Alcippe lampas* (in a burrow in the shell itself). The sponge, *Suberites domuncula*, is also often present.

EUPAGURUS PRIDEAUXI (Leach) (E 132 ; DW 136)

Off Stack Fort, one with *Adamsia*, in berry, 6.7.56, (JHB).

Tribe BRACHYURA Crabs

Leucosiidæ

Ebalia tuberosa (Pennant)

Gunkel, one under boulder, L.W.S.T., 14.5.53 ; one, 14.5.53, (JM).

Ebalia tumefacta (Montagu)

Dredged on gravel near Stack Rock, one, 17.9.49, (UCL) ; one male, 19.9.53, (EMS) ; one, 6.7.56, (JHB).

Corystidæ

Corystes cassivelaunus (Pennant) (DW 32 ; Y 225 ; RY 64 ; BY Plate xii)

Occasionally found in sand at L.W.S.T., but usually dredged or trawled. Dale Roads, Black Rocks, Gann Flats. Skomer—North and South Havens. March, April, September. In berry, 24.9.49, (UCL).

Atelecyclidæ

Atelecyclus septemdentatus (Montagu)

Occasional. Dredged in Dale Roads and off Watch House Point. One, on *Lithothamnion* in pool, Great Castle Head.

Pirimelidæ

Pirimela denticulata (Montagu) (E 133 ; BY Plate xii)

Haven, one, dredged, 15.4.49, (RDP).

Cancridæ

Cancer pagurus L. Edible crab (E 134 ; W 55 ; DW 24, 42, 114 ; Y 153 ; RY 38, 117, 120 ; BY Plate xii)

Large specimens are from the sub-littoral (Dale Roads, in pots and S. Hook to Gelliswick, in trawl) : small specimens occur occasionally on the shore—Gann Stones, Point Wood Beach, Slip Pier Beach, Dale Fort Beach, Castle Beach, Gateholm, Angle Bay. Skokholm—Crab Bay (abundant), Peter's Bay, North Haven. Skomer—South Haven, North Haven, Mew Stone. March, April, July, August. In berry, 30.5.50, (EMT).

Portunidæ Swimming Crabs (E 132)

Portunus puber (L.) Devil crab or Velvet fiddler crab (E 132 ; W 57, 58 ; W 121 ; Y 155, 162 ; BY Plate 15)

Abundant under boulders near L.W.M. Gann Stones, Gann Flats, Dale Beach, Point Wood Beach, Slip Pier Beach, Dale Fort Beach, in trawl between S. Hook and Gelliswick, in lobster pot at West Block House. Skokholm—Little Bay, Peter's Bay, Crab Bay. Skomer—North Haven, South Haven, Mew Stone. March, April, May, July, August, September.

PORTUNUS ARCUATUS Leach
Slip Pier, in *Laminaria* holdfast on buoy, September, 1948, (UCL). Dale Roads, trawl, 6.4.49, (RDP) ; July, 1949, (GO) ; dredge, 31.3.55, (JM).

PORTUNUS PUSILLUS Leach
Dale Roads, dredge, one, in berry, 12.4.54, (JM).

PORTUNUS MARMOREUS Leach (E 133)
Dale Beach, March 1949, (NWM) ; (RDP) : Dale Roads, dredge, 28.3.48 (RDP) ; September 1948, (UCL) : Block House Point, in lobster pot, 11.4.56, (JM).

PORTUNUS DEPURATOR (L.) (E 133 ; DW 24 ; (BY Plate 15)
Dale Roads and S. Hook to Gelliswick, in trawl and dredge. Common. March, April, May. In berry, 15.4.49 and 7.5.51.

CARCINUS MAENAS (L.) Shore, common, dog, or green crab (E133 ; W 56 ; DW 24 ; Y 26, 154 ; RY 46 ; H 172 ; BY Plate 15)
Ubiquitous, including the Gann Estuary to Mullock Bridge and the Gann Saltings. Pairing was noted in the Gann Estuary, 24.9.49, (UCL) and females in berry in March and April. The species has a marked tolerance for estuarine conditions.

PORTUMNUS LATIPES (Pennant) (=*P. variegatus*)
Marloes Sands, one in sand, L.W.S.T., 21.8.55, (GEB).

Xanthidæ (E 134)

XANTHO INCISUS Leach (E 134, Y 154, BY Plate xii)
Common at Castle Beach, Gateholm ; SKOMER—North and South Havens. Occasional at Gann Stones, Dale Beach, Point Wood Beach, Slip Pier Beach, Watwick Bay : SKOKHOLM—Peter's Bay, Crab Bay, South Haven, Dumbbell Bay : SKOMER—Mew Stone. Under boulders near L.W.M. March, April, May, August, September. In berry, April, May. One specimen at Gann Stones had a forked dactylopodite on the chela.

XANTHO HYDROPHILUS (Herbst) (E 135)
Gann Stones, 28.3.48, (RDP) ; one, 12.10.50, (EMT) : Gateholm, 28.3.48, (RDP). SKOKHOLM—Crab Bay Rocks, one, 26.3.48, (PD). L.W.S.T. There is some confusion regarding the synonomy of this species : see the Plymouth Fauna list.

PILUMNUS HIRTELLUS (L.) (BY Plate xii)
Common at Castle Beach, Gateholm and Stack Rock. Rare at Musselwick Point, Slip Pier Beach, Martin's Haven. SKOKHOLM—between Stack and Neck, Crab Bay. SKOMER—North and South Haven. L.W.S.T. under stones and in Laminaria holdfasts. In berry, 4.4.46.

Pinnotheridæ (E 135)

Pinnotheres pisum (L.) Pea crab (E 135 ; BY Plate 16)
Lives in the mantle cavity of mussels. One female in a trawled *Modiolus modiolus*, Dale Roads, 6.4.49, (RDP). Angle Bay, April 1953, (UB).

Maiidæ Spider crabs (E 135-6)

A feature of the spider crabs is their tolerance to growths on the shell. *Maia* often has barnacles but some of the smaller species carry polyzoa, hydroids, sponges, worm-tubes and sea weeds in such abundance as to hide the crab on the sea bed. It seems to be a form of camouflage.

Maia squinado (Herbst) Large or spiny spider crab (W 59 ; DW 92 ; BY Plate 16)
A sub-littoral species common in the trawl in Dale Roads. In some years very common in lobster pots all along the coast and occasionally from L.W.S.T. at Dale.

Eurynome aspera (Pennant) (BY Plate 16)
One dredged on shell gravel off Stack Rock, 18.9.53, (GTJ).

Hyas coarctatus Leach
Dale Beach, 28.3.48, (RDP) : off Stack Rock, on gravel, one male, one female, 6.7.56, (JHB).

Hyas areneus (L.) (E 136 ; Y 155 ; BY Plate 16)
Gann Stones, 28.3.48, (RDP).

Inachus dorynchus Leach (E 136)
Musselwick, one male, one female, L.W.S.T., 14.4.49, (RDP) : Dale Roads, dredge, March 1949, (NWM).

Macropodia rostrata (L.) (E 136 ; BY Plate 16)
Abundant in the dredge in Dale Roads and occasional at L.W.S.T. from Musselwick to Black Rocks. In berry, 6.3.50, (JHB).

Sub-Phylum **ARACHNIDA**

Class ACARINA

Order PROSTIGMATA

Halacaridæ

Rhombognathus setosus Lohmann
Skokholm—Abundant on *Entermorpha* near Purple Cave, August 1955, (JG).

Rhombognathus (Rhombognathides) pascens Lohmann
Skokholm—South Haven, rare in *Laminaria* holdfast, August 1955, (JG).

RHOMBOGNATHUS (RHOMBOGNATHIDES) MERRIMANNI Newell
Skokholm—North Haven and Crab Bay, common in *Laminaria* holdfasts; Peter's Bay, common in intertidal crevices, August 1955, (JG).

RHOMBOGNATHUS (RHOMBOGNATHOPSIS) ARMATUS Lohmann
Skokholm—Crab Bay, common in intertidal crevices, August 1955, (JG).

HALACARUS (HALACARELLUS) BASTERI Johnston
Skokholm—North Haven, one on *Corallina*, August 1955, (JG).

AGUOPSIS BREVIPALPUS Trovessart
Skokholm—Crab Bay, one in crevice, August 1955, (JG).

Class PSEUDOSCORPIONIDEA

Order NEOBISIINEA

Neobisiidæ

NEOBISIUM MARITIMUM (Leach)
Skokholm—Crab Bay, South Haven, in intertidal crevices, August 1955, (JG).

Class PYCNOGONIDA Sea spiders (E 140)

The sea spiders have sucking mouth parts and prey upon hydroids, anemones and polyzoa. They are often confined to one particular species of host. The male usually carries the eggs.

Nymphonidæ

NYMPHON GRACILE Leach (E 141)
Occasional on all beaches (including Skokholm) under stones, and in the trawl from Dale Roads.

NYMPHON RUBRUM Hodge
Dale Fort Beach, 13.9.50, (JG).

Phoxichilidiidæ

PHOXICHILIDIUM FEMORATUM (Rathke) (E 142)
Gann Flats, March 1955, (UB): Castle Beach, under stones, L.W.S.T., 29.3.49, (DWS).

ANOPLODACTYLUS ANGULATUS (Dohrn)
Slip Pier Beach, one, 9.9.54, (GTJ).

ANOPLODACTYLUS PYGMAEUS (Hodge)
Stack Rock, one female on *Alcyonidium gelatinosum*, L.W.S.T., 25.9.53, (GTJ).

ANOPLODACTYLUS EXIGUUS (Dohrn)

Gann Flats South, one on Polyzoa under stone on sand, 26.3.56, (UB).

AMMOTHEA ECHINATA (Hodge) (E 143)

SKOKHOLM—Hog Bay, one on hydroids, 27.3.52, (ECJ) : Peter's Bay, one, 21.7.55, (KST). L.W.S.T.

Pycnogonidæ

PYCNOGONUM LITTORALE (Ström) (E 141 ; Y 25 ; BY Plate xiii)

Slip Pier Beach, one on *Anthopleura* sp. in high rock pool, 28.3.48, (RDP). SKOKHOLM—Peter's Bay, one, 13.9.54, (HJM) : South Haven, one on *Actinia equina*, 29.3.56, (AWL).

Sub-Phylum **MYRIAPODA**

Class CHILOPODA Centipedes

HYDROSCHENDYLA SUBMARINA (Grube)

Among loose stones, sand and decaying *Fucus*. West Dale and Watwick.

Sub-Phylum **INSECTA**

Class APTERYGOTA

Order COLLEMBOLA Spring-tails

ANURIDA MARITIMA Laboulbene (=*Lipura*) (BY Plate xiii)

Common or abundant in mud, under stones, among barnacles, on pools and in crevices above M.T.L., on both sheltered and exposed coasts. Actual records include the lower Gann Estuary, Frenchman's Path (up to 60 per 1 ml. mud), Slip Pier Beach, Dale Fort Beach, Dale Point, Watwick Bay and the Spit on Skomer.

ANURIDELLA MARINA Willem

Slip Pier Beach, in small pool, M.T.L., 6.9.50, (det. T. Clay) (JHB).

Order THYSANURA Bristle-tails

Machilidæ

PETROBIUS MARITIMUS (Leach) (BY Plate xiii)

Abundant at and above H.W.M. ; Frenchman's Path, Slip Pier Beach, Dale Fort (outbuildings), Castle Beach, Watwick Bay.

Phylum **MOLLUSCA** (E 14, 144 ; DW 113)

Class POLYPLACOPHORA (Loricata, Amphineura, Chitons, E 172–3)

Lepidopleuridæ

LEPIDOPLEURUS ASELLUS (Gmelin) (E 173)

Musselwick, Point Wood Beach, Dale Roads (dredge). Occasional. L.W.M. and sub-littoral. March, July, Sept.

Lepidochitonidæ

TONICELLA RUBRA (L.) (E174).

Gann Stones, Slip Pier Beach, Gateholm. Occasional. L.W.S.T. March, April.

LEPIDOCHITONA CINEREUS (L.) (E 174 ; BY Plate xiv)

Gann Stones, Gann Estuary, Black Rocks, Point Wood Beach, Slip Pier Beach, Monk Haven. SKOMER—South Haven. Under stones. Not uncommon. March, September, November.

CALLOCHITON ACHATINUS (Brown) (E 174)

Gann Stones, Castle Beach, Martin's Haven. Under stones, L.W.S.T., up to 1 inch long. March, April.

Cryptoplacidæ

ACANTHOCHITONA CRINITUS (Pennant) (E 175 ; Y 33 ; BY Plate xiv)

From Musselwick Point round to the Slip Pier, Castle Beach and Gunkel ; Angle Bay. Common. March, July, September.

ACANTHOCHITONA DISCREPANS (Brown)

Dale Fort Beach, 26.7.50, (MRY) ; 27.7.50, (JHB) : Castle Beach, several under rocks in lower *Fucus vesiculosus* zone, 21.8.53, (ORB).

Class GASTROPODA

Winkles, whelks and sea-slugs (E 175, 178–181 ; H 176, 186).

Sub-Class PROSOBRANCHIA

Order ARCHAEOGASTROPODA

Fissurellidæ (E 183)

EMARGINULA RETICULATA J. Sowerby var. MULLERI Forbes and Hanley (E 183 ; BY Plate 17)

Castle Beach, one, 11.4.49, (RDP) ; occasional, (JHB) : Martin's Haven, (RDP). SKOMER—North Haven, one, April 1946, (UB). L.W.S.T.

DIODORA APERTURA (Montagu) Key-hole limpet (E.183 ; BY Plate 17)

Musselwick, Castle Beach, Watwick Bay, Great Castle Head, Martin's Haven. SKOKHOLM—South Haven. SKOMER—North Haven, South Haven, Mew Stone. Rare, L.W.S.T. March, April, August, September.

Patellidæ Limpets (E 181-2)

PATELLA VULGATA L. (E 182 ; W 81 ; Y 115–9 ; RY 24 ; BY Plate 17)

Ubiquitous. Upper part of shore. In 1949 the gonads began ripening at the end of August—males first—but fertilisations were not successful up to September 14th, (GO).

PATELLA INTERMEDIA Jeffreys (=*depressa*, E 182 ; BY Plate 17)

In Dale Bay only recorded from Slip Pier Beach. Common outside and on Skokholm. Found on vertical faces and overhangs ; prefers less exposed places than *P. vulgata* and is usually at a lower tide level.

PATELLA ASPERA Lamarck (=*athletica*, E 182 ; BY Plate 17)

In Dale Bay only recorded from Slip Pier Beach. Common outside and on Skokholm. Occurs on rock faces on the lower part of the beach but in pools (to the exclusion of the other two species) up to H.W.M.

During 1949 the gonads were ripe in July and August and fertilisations were easily carried out but became progressively more difficult from the last week of August, although success was attained on September 16th, (GO).

Limpets are common on Skomer but the species were not separated, and, indeed the species are difficult to separate superficially. *Patella vulgata*, the barnacles, dog-welks, and the anemone, *Actinia equina*, are the intertidal rock face inhabitants *par excellence*. Limpets breed mainly in January and February and their eggs are shed in very characteristic egg cases. Their larvae are planktonic and settlement was recorded in Watwick Bay in the *Fucus spiralis* zone on 25.4.52, (JHB).

The animals feed when the tide is in by scraping the algal film off the rock surface and the individual has a relatively small grazing area of perhaps a foot diameter, and within this area prevents the colonisation of the rock face by large sea weeds and possibly other species of sessile organism. On the fall of tide each limpet returns to its own ' home ' where it stays for the exposure period. It always orientes itself in exactly the same way and its shell grows or wears to fit the irregularities of the rock surface—or it wears away the rock—so that its home is marked by a scar. They grow up to 1 inch in one year and at three years are over 2 ins. long. A tall conical shape is characteristic of exposed, and a flattened shape (in the same species) of sheltered, or rock pool, situations.

Work by a Bristol student, Mr. B. A. Jones, established the following facts about limpets on Dale Point. On the exposed (Castle Beach) side of the Point a mid-tide pool contained 97% *P. aspera*, 1% *vulgata* and 2% *intermedia*. The adjacent dry rock surface had 1% *aspera*, 91% *vulgata* and 8% *intermedia*. In comparing the zonation at this place with that just round the Point on the sheltered (Dale Roads) side, Jones established that *vulgata* was found right up to H.W.S.T. level or even higher, was common on open rock faces but rare in pools or wet rock areas. It extended, in lesser abundance, down to L.W.S.T. but not below. That is, it prefers dry areas above M.T.L. *P. aspera* was abundant at L.W.S.T. (especially on the exposed side) and extended below. It extended little above this level except in rock pools where it was dominant up to H.W.N.T. *P. intermedia* was not found on the sheltered side and was not abundant on the exposed side. It occurred between H.W.N.T. and L.W.N.T. and although found in pools was commoner on the rocks. (In South West Ireland *P. aspera* occurred alone on the exposed coasts even at high levels. *P. vulgata* was dominant in the sheltered Lough Ine and *P. intermedia* was absent.) The larger specimens of *P. vulgata* occur high on the shore, and of *P. aspera* in the pools. The latter are larger than the former.

PATINA PELLUCIDA (L.) Blue-rayed limpet (E 182 ; Y 126 ; BY Plate 17)

Common or abundant on rocks or, more usually, weeds (*Laminaria, Rhodymenia palmata*) at L.W.M. on all coasts, exposed or sheltered ; also on Skokholm, on Skomer and in the sub-littoral. February to September. Sperm discharged 28.2.56, (JM).

Acmæidæ

ACMAEA VIRGINEA (Müller) (=*Patelloida*, E 184 ; BY Plate 17)

Musselwick, 12.10.50, (EMT) : Dale Beach, March 1949, (NWM) : Castle Beach 13.4.49, (JHB). SKOKHOLM—shells only. SKOMER—Mew Stone, April 1946, (UB). L.W.S.T. Rare.

Trochidæ Top shells (E 184)

Together with the winkles (*Littorina*), the top shells are useful for the demonstration of zonation on the shore.

CALLIOSTOMA ZIZYPHINUM (L.) Painted top (E 184 ; Y 126 ; ; BY Plate xiv)

Musselwick Point, Point Wood Beach, Dale Point, Castle Beach, Gunkel, Watwick Bay. SKOKHOLM—The Stack, Hog Bay, Crab Bay, Dumbbell Bay. SKOMER—North Haven, South Haven, Mew Stone, Basin. L.W.S.T. Common. White specimens are quite common among the normal ones and have been recorded from Musselwick Point, Dale Point, Gunkel, Watwick Bay, Hog Bay and the Mew Stone.

CANTHARIDUS DELANDI (Wood) (E 185)

Castle Beach, common, L.W.E.S.T., 13.9.54, (UCW).

GIBBULA (MONODONTA) LINEATA (da Costa) Toothed top (=*Osilinus*, E 185 ; DW 66 ; Y 119 ; BY Plate xiv)

Frequent in the whole of Dale Bay, including the Gann Estuary, and at Castle Beach, Gateholm and on Skokholm. Common on Skomer, and abundant at St. Bride's Haven where it was zoned above *Littorina littorea*, overlapping it by about one foot, and with a maximum abundance 6 to 8 feet below H.W.M. The population was scattered on rock (in full sun), among weed and in pools, and was nowhere clumped.

GIBBULA (GIBBULA) MAGUS (L.) var. TUBERCULATA (da Costa) (E 186 ; BY Plate xiv)

Gann Flats, Point Wood Beach, Castle Beach, Dale Roads. L.W.M. and sub-littoral. Occasional, except in July 1953, when it was common on the Gann Flats from L.W.N.T. downwards (JHB).

GIBBULA (GIBBULA) CINERARIA (L.) Grey top (E 186; Y 128 ; BY Plate xiv)

Common near L.W.M. on rocky shores all round Dale Bay, at Castle Beach and Angle Bay, on Skokholm and Skomer (including the sub-littoral).

GIBBULA (GIBBULA) UMBILICALIS (da Costa) Purple top (E 186 ; Y 128 ; BY Plate xiv)

Common on all rocky shores in Dale Bay ; Castle Beach, West Dale Bay, Great Castle Head, Angle Bay, St. Bride's Haven ; and on Skokholm and Skomer. Occasionally found in the mouth of the Gann.

Turbinidæ

TRICOLIA PULLUS (L.) var. PICTUS (da Costa) (E 186 ; BY Plate xiv)

Slip Pier Beach, Castle Beach, Great Castle Head, Martin's Haven, Dale Roads. SKOKHOLM—Peter's Bay, North Haven. Occasional. But common at Castle Beach and North Haven. L.W.S.T. and below. Under stones and among weeds.

Order MESOGASTROPODA

Littorinidæ (=Lacunidæ, E 186-7) Winkles

The species of *Littorina* provide the best example of animal zonation on the shore. See Y Chap. 14, C 176–180.

LACUNA VINCTA (Montagu) (E 188 ; BY Plate xiv)

Slip Pier, 28.3.48 ; Dale Roads, dredge, 8.4.49. Rare. (RDP).

LACUNA PALLIDULA (da Costa) (E 188)

SKOKHOLM—Crab Bay, 12.4.48, (BW) : Peter's Bay, 12.4.48, (BW) ; frequent, 1.8.50, (HJMB).

LITTORINA LITTORALIS (L.) Flat winkle (=*obtusata*, E 188, Y 127, RY 25 ; BY Plate xiv)

Common in Dale Bay, including the Gann Estuary, (but not actually recorded from Black Rocks), Castle Beach and Angle Bay. Rare at West Dale Bay. Common on Skokholm and Skomer. On weeds up to about H.W.N.T. Egg masses on weeds, 2.4.46, (UB) and 3.3.51 (JHB). Larvae planktonic.

LITTORINA LITTOREA (L.). Common or edible winkle (E 187 ; W 83 ; DW 64 ; Y 118 ; RY 28 ; BY Plate xiv)

Occasional at Musselwick Point, Gann Estuary, Slip Pier Beach, Dale Fort Beach, Castle Beach and SKOKHOLM—Peter's Bay, Crab Bay and South Haven. Common at Frenchman's Path, Angle Bay and on SKOMER—North and South Havens. Abundant at Black Rocks (L.W.N.T.) and at St. Bride's Haven where it was zoned below *Gibbula lineata*, had a maximum abundance at 8 to 10 ft. below H.W.M. and was found largely in pools (6.4.51). (JHB). Eggs and larvae planktonic.

The rarity of this species in Dale Bay with no records for Gann Stones, Gann Flats, Brig Stones, and Point Wood Beach, nor for Watwick and other outside stations, suggests that its occurrence has simply not been recorded. The abundance and zonation of *L. littorea* and, perhaps, its zonation with reference to that of *Gibbula lineata*, require examination.

LITTORINA SAXATILIS (Olivi) Rough winkle (=*rudis*, E 187 ; W 82 ; Y 118 ; BY Plate xiv)

Ubiquitous at H.W.N.T. and above, extending into the splash zone with *L. neritoides*, on sheltered, exposed and estuarine coasts. Viviparous.

On exposed shores the specimens are said to be rougher and smaller than in sheltered places (GO) but Marloes Sands specimens are deeply ridged whereas on Skomer, in exposure, they are not (JHB). On Skokholm at Hog Bay, three types have been recorded :—(*a*) in the *Fucus spiralis* zone—up to 20 mm. long, dark, medium spire, spirally striate ; (*b*) in and above the *Pelvetia* zone, and also near L.W.M. ; up to 12 mm., orange colour, medium spire, spirally striate ; and (*c*) in the *Fucus* zone ; purple-brown, spire long, smooth (CED). Orange specimens predominate at St. Bride's Haven and on the N.E. side of Gateholm (JHB) and the young, near Dale Point, are smooth and white with orange brown markings (MRY).

LITTORINA NERITOIDES (L.) var. PETRAEA (Montagu) Small winkle (BY Plate xiv)

Characteristically occurs at and above H.W.M. on exposed shores. It has been so recorded in the Dale records on all exposed shores and extends a little way into shelter :—occasional, Slip Pier

Beach (RDP, EMT, UB), Castle Beach (JHB) and Angle Bay. Absent at Dale Fort Beach (MRY). Larvae planktonic.

At West Dale Bay and Skokholm South Cliff it has been recorded 30 ft. above H.W.M., (GO, KGM) and, in barnacle shells at West Dale Bay, down to 4 ft. above L.W.S.T., (GO). On Skomer specimens grew to 12 mm., (JHB).

Hydrobiidæ (E 191)

PERINGIA ULVAE (Pennant) (=*Hydrobia* E 191 ; BY Plate xv)

Gann Estuary, from 400 yds. below Mullock Bridge to mouth, 25.11.48, (NWM) ; range restricted on 31.3.50 as compared with 1.4.49, (NWM) : Gann Saltings, abundant, 8.4.49, (RDP). An estuarine and brackish water species.

POTAMOPYRGUS JENKINSI Smith (=*Hydrobia*) (BY Plate xv)

This species has invaded brackish and fresh waters during this century and is present in the stream flowing onto Castle Beach (EMT, UMG, UCW).

Rissoidæ (E 189)

These small snails are usually overlooked by hand-collectors because they are so small and are probably much more widespread than the records indicate.

CINGULA (ONOBA) SEMICOSTATA (Montagu) (E 190)

Musselwick, several, L.W.S.T., 3.4.50, (NWM) : Slip Pier Beach, under stones on gravel, 10.8.50, (EMT). SKOKHOLM—North Haven, one, 31.7.50, (HJMB) : Crab Bay, Common in muddy places, 2.8.50, (HJMB).

CINGULA (CINGULA) CINGILLUS (Montagu) (E 190)

Musselwick, under stones among shingle, 14.9.50, (EMT): Dale, 28.3.53, (MRY) : Slip Pier Beach, common under stones, M.T.L., 28.3.48, (RDP) : Dale Fort Beach, 26.7.50, (MRY). SKOKHOLM—Peter's Bay, one, 1.8.50, (HJMB).

CINGULA (CINGULA) SEMISTRIATA (Montagu) (E 190)

SKOKHOLM—Peter's Bay, common 1.8.50 ; Crab Bay, one, 2.8.50 ; North Haven, common below L.W.M., 3.8.50, (HJMB).

CINGULA (PARVISETIA) FULGIDA (J. Adams) (E 190)

SKOKHOLM—Peter's Bay, rare, 17.8.48, (JHB) ; one, 1.8.50, (HJMB).

RISSOA (TURBOELLA) PARVA (da Costa) (E 189 ; W 123)

Musselwick, several, L.W.S.T., 3.4.50, (NWM) : Gateholm, abundant in *Cladophora rupestris*, 28.3.48, (DRP). SKOKHOLM—North Haven, common, 31.7.50 ; Peter's Bay, common, L.W.M., 1.8.50, (HJMB).

Skeneopsidæ (E 192)

SKENEOPSIS PLANORBIS (Fabricius) (E 192)

SKOKHOLM—North Haven, abundant on *Corallina*, common on *Lomentaria articulata*, 20.8.55, (JG).

Turritellidæ

TURRITELLA COMMUNIS Risso Turret shell (BY Plate xiv)

Common in the sub-littoral ; Dale Roads, off Angle Lifeboat slipway and off North Haven on Skomer : occasional at L.W.M. ; Brig Stones and Angle Bay.

Aporrhaidæ

APORRHAIS PES-PELICANI (L.) QUADRIFIDUS da Costa Pelican's foot shell (BY Plate xiv)

Dredged in Dale Roads off Monk Haven and Watch House Point. Common. With *Turritella*.

Cerithiidæ (E 191)

BITTIUM RETICULATUM (da Costa) (E 191 ; BY Plate xiv).

Point Wood Beach, August 1950, (EMT). SKOKHOLM—South Haven, on *Halichondria*, 31.7.50, (HJMB).

Cerithiopsidæ (E 192)

CERITHIOPSIS TUBERCULARIS (Montagu) (E 192)

Brig Stones, one, 31.7.50, (JHB) : Great Castle Head, 26.7.50, (MRY).

CERITHIOPSIS CLARKII Forbes and Hanley

Great Castle Head, 26.7.50, (MRY).

Epitoniidæ

CLATHRUS CLATHRUS (L.) (BY Plate xiv)

Off Stack Rock, one dredged on shelly gravel, 18.9.53, (GTJ). A dead shell from Dale Beach was determined by W. J. Rees.

Janthinidæ

JANTHINA BRITANNICA Forbes and Hanley (BY Plate xv)

West Dale Bay, one, alive, 6.9.50, (EMT). Dead shells have been found in West Dale Bay and Marloes Sands in August and September. This warm-water species with its deep violet or purple shell and body, secretes a float (on the underside of which it attaches its eggs) and occasionally drifts ashore in the same was as the floating *Physalia*, *Velella* and *Lepas fascicularis*.

Pyramidellidæ

No records of this family have been made at Dale but the recent work of Fretter and Graham suggests that if searched for in the right place, they will probably be found. These very small snails are equipped with a long proboscis armed with a piercing stylet and equipped with a sucking pump. They live near the opening of the appropriate species of bivalve or tubicolous worm and when the host opens to feed they suck juices from the mantle edge or tentacle. Thus, if the shells of bivalves or the external walls of polychaete tubes are searched carefully, pyramidellids should quickly be found. One species is known to damage oysters.

Naticidæ (E 194)

NATICA CATENA (da Costa) (E 194 ; Y 237 ; BY Plate xv)

Musselwick Point, one under stone, L.W.S.T., 28.3.48, (RDP) : Milford Haven, off Angle Lifeboat Slip, one, dredge, 15.4.49, (RDP). Broad Haven, dead shells with hermit-crabs, 20.4.50, (EMT).

Calyptræidæ (E 193)

CALYPTRAEA CHINENSIS (L.) Chinaman's hat limpet (E 194 ; BY Plate 17)

Common from Gann Stones to Slip Pier Beach, in Angle Bay and in Dale Roads. L.W.N.T. to sub-littoral.

CREPIDULA FORNICATA (L.) Slipper limpet (E 194 ; Y 276 ; BY Plate 17)

Single individuals and small chains in Pennar Gut, 1953 (Baird, R. H. and H. A. Cole) : on rocks, stones and shells in ones and twos at L.W.S.T. and below, in Pennar Gut, Neyland, Hazelbeach and Pwllchrochan Flats, January 1954, (BTH).

This interesting filter-feeding gastropod is a pest on oyster beds due to the fact that it lives in considerable numbers on top of the oysters and, feeding like the oyster on the floating plankton and detritus, it gets first chance and starves the oyster. It first appeared, probably from North America on imported oysters, about 80 years ago and has spread to oyster beds on our south-east and south coasts. Its (presumably) recent arrival in Milford Haven shows a considerably slower spread than that of the New Zealand barnacle, *Elminius*, which has spread from the English Channel to the Scottish borders in ten or twelve years.

Cypræidæ Cowries (E 196)

ERATO VOLUTA (Montagu)

Castle Beach, one in crevice, L.W.S.T., 28.8.49 ; Dale Roads, one, dredge, 3.9.49, (GO).

TRIVEA MONACHA (da Costa) (E 196 ; Y 147 ; BY Plate xv)

Common, Musselwick Point and South Haven, Skomer : occasional, Slip Pier Beach, Castle Beach and Angle Bay. L.W.M., under stones and among *Fucus serratus*.

TRIVEA ARTICA (Montagu) (E 196; BY Plate xv)

Common, Musselwick Point and North Haven, Skomer: occasional, Slip Pier Beach, Castle Beach. SKOKHOLM—South Haven, Crab Bay. SKOMER—Mew Stone. Under stones in *Laminaria* zone.

The two species of *Trivea* are notable in three ways. The mantle tissues spread out over the outside of the shell thereby keeping it smooth; they feed with the aid of a proboscis and radula on compound ascidians; and they deposit their egg capsules in holes which they excavate in the gelatinous colonies on which they feed.

Lamellariidæ (E 195)

LAMELLARIA PERSPICUA (L.) (E 195; BY Plate xv)

Musselwick Point, Slipway Beach, Castle Beach. Occasional under boulders, L.W.S.T., March, July, August.

VELUTINA VELUTINA (Müller) (E 195; BY Plate xv)

Gann Stones, 28.3.48, (RDP).

Order STENOGLOSSA

Muricidæ (E 196)

NUCELLA LAPILLUS (L.) (=*Purpura*) Dog-whelk (E 196; W 84; DW 66; Y 119, 129, 131; RY 33; BY Plate xvi)

Ubiquitous, including Grassholm. Very variable in shape: as the exposure increases so the shell thickens, the ornamentation and total length lessen, and the proportion of the total length occupied by the mouth increases. Usually white (when feeding on barnacles) but banded or dark (when feeding on mussels). It feeds on barnacles in preference to mussels but grows better on the latter diet. In feeding on barnacles it forces the proboscis in past the opercular plates , but for mussels, it bores a neat circular hole through the shell. Its well-known, vase-shaped, cream coloured egg capsules have been recorded in March, May, July and September.

OCENEBRA ERINACEA (L.) (E197; DW 44; BY Plate xvi).

Occasional only; Musselwick Point, Black Rocks, Castle Beach, Angle Bay, Dale Roads (dredge). SKOKHOLM—Crab Bay; SKOMER—North Haven: but common at Gunkel (GO) and absent at Slip Pier Beach and Gateholm (RDP). L.W.S.T. and below. March, April, May, July, August.

NEPTUNEA ANTIQUA (L.) (BY Plate xvi)

Gann Flats, one, L.W.M., 6.3.50, (JHB).

Buccinidæ

BUCCINUM UNDATUM L. Whelk (E 197; DW 118, 130; Y 170; RY 199; BY Plates xxv, xvi)

A sub-littoral species found in Dale Roads and often taken in small numbers at L.W.S.T. from Musselwick to the Slip Pier. Five were found on a dead *Carcinus* (6.3.50, JHB) on the Gann Flats. Egg masses occurred in the trawl in April and May. Newly hatched young were seen on 8.3.51, the capsules containing from 3 to 10 young each (JHB). On 20.12.56 the adults and their newly deposited egg-capsules were very abundant indeed near L.W.E.S.T. on the Gann Flats, (JH).

Nassariidæ (E 197)

NASSARIUS RETICULATUS (L.) (E 198 ; BY Plate xvi)

Occasional, L.W.M. ; Musselwick, Black Rocks, Castle Beach, Martin's Haven, Angle Bay. SKOKHOLM—South Haven. SKOMER—North and South Havens, and dredged in North Haven. Egg capsules, Skomer, 2.4.46, (UB).

NASSARIUS INCRASSATUS (Ström) (E 198 ; BY Plate xvi)

Martin's Haven, common under boulders, L.W.S.T., 12.4.49, (RDP) : Angle Bay, April 1953, (UB). SKOKHOLM—Crab Bay, rare, 14.9.54, (HJM). SKOMER—North Haven, one, April 1946, (UB).

Turridæ (E 198)

MANGELIA NEBULA (Montagu)

Dale Beach, one sieved in sand, Sept. 1948, (RDP).

Sub-Class OPISTHOBRANCHIA

Order BULLOMORPHA

Acteonidæ (E 199)

ACTEON TORNATILIS (L.) (E 199 ; BY Plate 18)

Dale Beach, one on surface of sand, L.W.S.T., 13.4.49, (RDP) : several, 12.4.49, (JHB).

Atyidæ (Akeratidæ, E 200)

AKERA BULLATA Müller (E 200 : BY Plate 18)

Stack Rock, two, 22.9.52, (EMS and GTJ).

Scaphandridæ

CYLICHNA CYLINDRACEA (Pennant)

Dale Beach, 28.3.48, (RDP).

TRICLA LIGNARIA BROWNII Leach

Dale Beach, one on sand, L.W.S.T., 2.4.50, (NWM) : Dale Roads, one in dredge, 29.4.52, (EMT).

Philinidæ (E 200)

PHILINE APERTA (L.) QUADRIPARTITA Ascanius (E 200)

Dale Roads, dredge, one, 6.4.49, (RDP) : occasional, especially in August, 1951, (EMT).

Peltidæ (E 200)

PELTA CORONATA Quatrefages (BY Plate 18)

Castle Beach, one in pool, M.T.L., 27.4.50, (JHB). SKOKHOLM—Crab Bay, one, L.W.M., 22.7.55, (KST) : one in pool, 27.6.56, (CRT).

Order APLYSIOMORPHA

Aplysiidæ (E 201)

APLYSIA PUNCTATA Cuvier Sea hare (E 201 ; DW 118 ; Y 169 ; BY Plate 18)

Aplysia has been taken all round Dale Bay, in Dale Roads, at Angle and West Dale Bays and Peter's Bay on Skokholm. It spawns late (Dale Beach, September 1948, RDP) and the coiled pink threads of eggs give rise to planktonic larvae which eventually settle and grow mainly in the sub-littoral to spawn next year on the shore. It was widespread but rare in Dale Bay in 1948 but abundant on Dale Beach in September. There are no records for 1949, very few from 1950 to 1952, none in 1953, quite a number in 1954, a few in 1955 and none in 1956. It is a southern species extending northwards to our coasts, and, as may be expected of an animal near its limit of distribution, its numbers vary considerably from year to year, and past records hold no clue to its future abundance.

Order SACOGLOSSA

Elysiidæ

ELYSIA VIRIDIS (Montagu) (E 203 : BY Plate 21)

Musselwick, one, 25.9.49, (GO) : Gann Flats, one, Sept. 1948, (RDP) : Black Rocks, one in *Ascophyllum* zone, M.T.L., 20.4.54, (JM) : Castle Beach, in rock pool, H.W.N.T., 27.3.49, (DWS).

Limapontiidæ

LIMAPONTIA CAPITATA (Müller) (BY Plate 21)

Slip Pier Beach, in *Cladophora* among *Fucus*, 12.3.49, (DWS) : Castle Beach, two on stone, 5.8.49, (GO) : SKOKHOLM—Crab Bay, three, L.W.M., 22.7.55, (MEB).

Order PLEUROBRANCHOMORPHA

Pleurobranchidæ (E 201)

BERTHELLA PLUMULA (Montagu) (E 201 ; BY Plate 18)

Musselwick Point, Gann Flats, Dale Beach, Slip Pier Beach, Castle Beach. Occasional. March, April, July. Abundant once, at Musselwick, 28.3.48, (RDP).

PLEUROBRANCHUS MEMBRANACEUS (Montagu) (E 202 : BY Plate 18)
Black Rocks, Dale Beach, Great Castle Head, Dale Roads. Occasional. L.W.S.T. and below. Common once, on Dale Beach, 3.4.54, (UB).

Order NUDIBRANCHIA

The nudibranchs are among the most beautiful of marine animals. They feed on an unusual diet of sponges or coelenterates, often being restricted to a particular species. The nematocysts of the prey are in some cases passed undischarged to the tips of the cerata and may there be used in defence of the nudibranch itself. Many species assemble on the shore to mate and produce characteristic spirally-coiled ribbons of spawn. The larvae are planktonic.

Sub-Order DORIDACEA

Polyceridæ (E 204)

EUPHURUS CLAVIGER (Müller) (E 205)
Watwick Bay, under stones among sponges, L.W.S.T., 19.7.51 ; one in pool, 18.7.54, (HJ).

POLYCERA QUADRILINEATA (Müller) (E 205 ; BY Plate 20)
Watwick Bay, on polyzoan, L.W.S.T. ; four on polyzoan on *Delesseria* on lobster pots, 3.8.51 ; West Dale Bay, one, 20.7.56, (JHB). SKOKHOLM—South Haven, one, 18.7.55, (KST).

PALIO NOTHUS (Johnston) (E 207)
Dale Beach, one, September 1951, (UCL).

Onchidorididæ

ACANTHODORIS PILOSA (Abildgaard) (E 206 ; BY Plate 20)
Gann Stones, Gann Flats, Point Wood Beach, common in March ; mainly white, one black : St. Ann's Head, one, 25.3.52, (NWM).

ACANTHODORIS SUBQUADRATA (Alder and Hancock)
Slip Pier Beach, two, L.W.S.T., 12.4.48, (RDP)

ONCHIDORIS MURICATA (Müller) (E 207 : BY Plate 19)
Dale, one, September 1951, (UCL).

ONCHIDORIS FUSCA (E 207 ; DW 116 ; RY 33 ; BY Plate 19)
Monk Haven in dredge, two, 23.4.51, (EMT) : eleven with spawn, 27.4.53, (JP).

ONCHIDORIS SPARSA (Alder and Hancock)
Off Stack Rock, several dredged, 6.9.56 (Det. J. Forrest) (BR).

ONCHIDORIS INCONSPICUA (Alder and Hancock)
Dale, one, September 1951, (UCL).

Okeniidae

GONIODORIS NODOSA (Montagu) (E 206 ; BY Plate 20)

From one to twenty specimens—Gann Flats, Dale Beach, Point Wood Beach, Slip Pier Beach, Castle Beach, Gunkel, Gateholm, Martin's Haven, Angle Bay, Dale Roads, off Stack Rock. SKOKHOLM—Crab Bay. SKOMER—Mew Stone. L.W.S.T. and below. March, April, July, September, November. Spawn, 3.3.51, (JHB).

GONIODORIS CASTANEA Alder and Hancock (BY Plate 20)

Dale Roads, one in dredge, 17.9.53, (EMS).

ANCULA CRISTATA (Alder) (E 206 ; BY Plate 20)

SKOKHOLM—Crab Bay, one, 24.3.52, (P di B).

Glossodorididæ (E 208)

ROSTANGA RUFESCENS Iredale and O'Donoghue (E 208 ; BY Plate 19)

One each at Musselwick Point, Castle Beach, Gunkel and Stack Rock. March, August, September. L.W.S.T.

ARCHIDORIS PSEUDOARGUS (Rapp) (=*brittanica* + *flammea*) Sea lemon (E 208 ; W 86 ; DW 44 ; Y 108 ; BY Plate 19)

On all rocky shores, exposed and sheltered, including Skokholm and Skomer. March, April, July, August, September. Spawn, March, April, May, September. Copulation, 3.3.51.

JORUNNA TOMENTOSA (Cuvier) (E 208 ; BY Plate 19)

Occasional, Musselwick, Dale Beach, Slip Pier Beach, Castle Beach, Martin's Haven. SKOMER—North Haven. March, Aug. Spawn, August.

Sub-Order EOLIDACEA

Coryphellidæ (Flabellinidæ, E 213)

CORYPHELLA VERRUCOSA (M. Sars) PELLUCIDA (Alder and Hancock) (E 213).

Musselwick, rare under rocks with sponges and ascidians, L.W.S.T., 4.4.54, (UB).

CORYPHELLA PEDATA (Montagu) (E 213)

Gann Stones and Castle Beach. Under stones, L.W.S.T. March, April, September. Of regular occurrence in small numbers.

Facelinidæ

FACELINA AURICULATA (Müller) (=*longicornis* + *drummondi* + *coronata*) (E 211 ; BY Plate 21)

Musselwick Point and Little Bay on Skokholm. March and August. L.W.S.T.

Aeolidiidæ

AEOLIDIELLA GLAUCA (Alder and Hancock) (includes *Aeolidina alderi* and *Eolis angulata*)

Musselwick Point, 28.3.48, (RDP).

AEOLIDIA PAPILLOSA (L.) (E 211 ; W 87 ; Y 109 ; RY 47 ; BY Plate 21)

Occasional on rocks from Musselwick to the Slip Pier ; and Angle Bay. March, April. Spawn, April.

Sub-Class PULMONATA (E 214)

Order BASOMMATOPHORA

Ellobiidæ (E 214)

LEUCOPHYTIA BIDENTATA (Montagu) (E 214)

Gann Estuary, gregarious under stones, September 1948, (UCL) : Slip Pier Beach, Oct. 1950, (UMG).

Class LAMELLIBRANCHIA Bivalves (E 145, 149)

Order PROTOBRANCHIA

Nuculidæ

NUCULA NUCLEUS (L.)

From Thorn Island to Angle Bay, occasional in dredge, 15.4.49, (RDP).

NUCULA TURGIDA Leckenby and Marshall

Dale Beach, a few sieved from sand, March 1948, (RDP).

Order DYSODONTA

Mytilidæ (E 153)

MODIOLUS MODIOLUS (L.) (E 153 ; BY Plate 22)

Dale Roads, one, trawl, 6.4.49, (RDP) : Martin's Haven, two, dredge, 27.4.53, (JP) : Pwllchrochan Flats, common on muddy sand and gravel below L.W.N.T., January 1954, (BTH).

MODIOLUS BARBATUS (L.) (E 153 ; BY Plate 22)

Gunkel, one in crevice, *Ascophyllum* zone, 21.8.53, (ORB) : Monk Haven, one, dredge, 27.4.53, (JP).

MODIOLUS PHASEOLINUS (Philippi) (BY Plate 22)

SKOKHOLM—Crab Bay, dead shell.

MUSCULUS MARMORATUS (Forbes) (BY Plate 22)

Castle Beach, one in test of ascidian, L.W.S.T., 11.4.49, (RDP) : 27.8.49, (GO).

CRENELLA DECUSSATA (Montagu)

SKOKHOLM—Common among *Flustra* and *Sertularella* in lobster pots, 26.6.50, (JHB).

MYTILUS EDULIS L. Common mussel (E 152 ; W 75 ; Y 133, 138 ; RY 303 BY Plate 22)

Small specimens are abundant in crevices on all rocky shores, including Skokholm and Skomer from the barnacle zone down to L.W.S.T., and they extend into the Gann Estuary. Larger specimens are found on Gann Flats, Marloes Sands and in Dale Roads : they occur between tide marks from Angle Bay to Little Milford, and are present in Pennar Gut, Carew and Creswell Rivers (lower reaches only) and Sandy Haven. Very few occur below L.W.S.T. in the upper reaches of the estuary. There is an extensive bed at Fowborough Point.

The species is infested with *Mytilicola.*

Recent work suggests that not all are of this species, some being *M. galloprovincialis.*

It is obvious that feeding in intertidal animals must be rhythmic since they can usually only feed when the tide is in. It has recently been shown that the digestive processes of the small bivalve *Lasaea rubra* are also rhythmic—and begin when submergence and the possibility of feeding begins. But it seems likely that the rhythm is entirely dependent on external stimuli because the processes can be started off at the 'wrong' time by submergence. In intertidal *Mytilus,* however, the feeding rhythm is inherent. If the rate of passage of water through the mantle cavity is measured it can be shown that the rate is high when the tide is in and low when the tide is out, even though the specimen is lying in an aquarium all the time. Furthermore this rhythm is maintained for up to a week even if the animal is kept in water under stable conditions. Thus intertidal mussels from different parts of the coast (where the time of high water is different) can be separated in the laboratory, even after their prolonged journey by rail, because their rate of pumping water rises to a maximum at the appropriate, different, times.

MYTILUS GALLOPROVINCIALIS Lamarck

Thirty per cent of *Mytilus* in Angle Bay are of this species, (B. T. Hepper, 1957, Journ. Mar. Biol. Assoc. U.K. *36*, 1. 33–40), and it doubtless occurs elsewhere.

Order PSEUDOLAMELLIBRANCHIA

Anomiidæ (E 150)

This family is noted for its single adductor muscle, the calcified byssus which seems to pierce the lower valve and for its simple gill filaments.

ANOMIA EPHIPPIUM L. (E 150; BY Plate xvii)
Slip Pier Beach, common in rock pool, *Ascophyllum* zone, 20.8.53, (ORB): Angle Bay, April 1953, (UB): (two shells, 2 ins. across from crabs in deep water off St. Ann's Head, years ago, JHB) SKOKHOLM—Peter's Bay, 11.8.49, (GO): North Haven, 29.7.50, (HJMB): Crab Bay, 29.7.50, (HJMB); 14.9.54, (HJM). Common under stones and in *Laminaria* holdfasts.

MONIA PATELLIFORMIS (L.) (E 151; BY Plate xvii)
Musselwick, March 1955, (UB): Dale Roads, one, dredge, 30.4.56, (JM).

HETERANOMIA SQUAMULA (L.) (E 151)
Slip Pier Beach, Castle Beach, Watwick Bay, Gateholm, Martin's Haven. SKOKHOLM—North Haven, Crab Bay. Common under stones and in *Laminaria* holdfasts, L.W.S.T. and in pool, *Ascophyllum* zone. March, July, August.

Pectinidæ Scallops (E 153)

All species have a single adductor muscle. Some are attached by the byssus, others are free and have no byssus. These latter may swim by a snapping of the shell—either hinge foremost or hindmost. The mantle edge has well developed tentacles and eyes.

CHLAMYS OPERCULARIS (L.) (E 154; RY 308; BY Plate 22)
Musselwick Point, Point Wood Beach, Slip Pier Beach, Castle Beach, Dale Roads, dredge and trawl, S. Hook to Gelliswick, trawl. L.W.S.T. and below, in crevices. Occasional.

CHLAMYS VARIA (L.) (E 154; BY Plate 22)
Gann Stones, Gann Flats, Brig Stones, Point Wood Beach, Dale Roads (dredge). SKOKHOLM—Crab Bay. Occasional, up to 7 cm. on shore anchored to stones and *Gigartina stellata* (JHB), up to 13 cm. in dredge on muddy stones and gravel (GTJ).

CHLAMYS DISTORTA (da Costa) (E 154; BY Plate 22)
Musselwick, Castle Beach, Martin's Haven. L.W.S.T., up to 2 inch. Occasional.

PECTEN MAXIMUS (L.) (E 153, Y 169, RY 308: BY Plate 22)
Musselwick Point, Angle Bay, Dale Roads, Watch House Point. Occasional. L.W.S.T. and below.

Order EULAMELLIBRANCHIA

Ostreidæ (E 154)

OSTREA EDULIS L. Oyster (E 154; RY 199, 294, 297; H 187; BY Plate xvii)
Musselwick Point, Gann Flats, Dale Beach, Point Wood Beach, Dale Roads and Watch House Point (dredge). Occasional,

L.W.S.T. and below. Up to 13 by 15 cm. Larvae in plankton, 8.8.56, (P. Warren).

Sixty years ago there was a successful oyster fishery in Milford Haven but the last commercial dredging took place 30 years ago. The decline is attributed by Dr. H. A. Cole to uncontrolled exploitation and he further suggests that a commercial fishery could be re-established and has recommended trial plantings of oysters in suitable areas in Dale Bay, Pennar Gut and Angle Bay, which have been done and promise success.

Astartidæ

ASTARTE SULCATA (da Costa)

Dale Roads, trawl, 10.10.50, (EMT) : many dredged half mile east of Thorn Island, 15.4.49, (RDP).

Cyprinidæ

CYPRINA ISLANDICA (L.)

Occasional in Dale Bay either ashore (Lower Gann, Black Rocks, Dale Beach. L.W.S.T.), or by dredge.

Most of the British marine fauna is of species belonging to northern latitudes which extend southwards to Great Britain, or of more southern species extending northwards to Great Britain—both types dying out, but overlapping, in the English Channel area, thus producing a varied fauna. Only a few species are true temperate species, extending north and south from Great Britain, and *Cyprina* is one of this small group.

Ungulinidæ

THYASIRA FLEXUOSA (Montagu)

Dale Beach, 28.3.48, (RDP) : Brig Stones, one valve, 31.7.50, (JHB)

Lucinidæ (E 155)

LUCINOMA BOREALIS (L) (E 155 as *Phacoides* ; BY Plate xix)

Gann, Dale Beach, 28.3.48, (RDP).

Erycinidæ (E 155)

LASAEA RUBRA (Montagu) (E 156)

Black Rocks, two in sandy gravel, 26.4.49, (JHB) : Castle Beach, 28.3.48, (RDP). SKOKHOLM—Crab Bay, one, 13.9.54, (HJM).

This small bivalve is widespread between tide marks on rocky shores and is often found in abundance among the lichen, *Lichina pygmaea* (150,000 per square yard) near H.W.M. (C 175). The digestive rhythm is governed by the tide—see note under *Mytilus edulis*.

KELLIA SUBORBICULARIS (Montagu) (E 155)
Musselwick Point, rare in crevices, 28.3.48 ; Castle Beach, a few, L.W.S.T., 11.4.49, (RDP).

Montacutidæ

MONTACUTA FERRUGINOSA (Montagu)
Commensal with *Echinocardium cordatum*. Gann Flats, March 1955, (UB) : Dale Beach, 13.4.49, (RDP) ; 26.3.52, (NWM).

Cardiidæ Cockles (E 157)

LAEVICARDIUM CRASSUM (Gmelin) E 157
Dale Beach, one in sand, 24.9.49, (GO) : Dale Roads, dredged, two, 25.9.50, (JHB) ; one, 10.10.50, (EMT).

CARDIUM EXIGUUM Gmelin (BY Plate xviii)
Black Rocks, two in sand, L.W.S.T., 28.3.48 ; dredged east of Stack Rock, a few, 15.4.49, (RDP).

CARDIUM EDULE L. Common cockle (E 157 ; Y 229 ; RY 306 ; BY Plate xviii)
In muddy sand from Point Wood Beach to the Gann Flats, Gann Saltings and Gann Estuary nearly up to Mullock Bridge. 1952 was a good year and collectors got up to 1,500 each in August. Angle Bay, April 1953, (UB). SKOKHOLM—South Haven, one, 31.7.50, (HJMB).

CARDIUM ECHINATUM L. Spiny cockle (BY Plate xviii)
Gann Sand, very common, 6.3.50 ; Black Rocks, common in sand, L.W.S.T., 28.3.48, (JHB).

Veneridæ (E 158)

DOSINIA EXOLETA (L.) (E 159 ; BY Plate xix)
Gann Flats, one 1¼ in., 26.9.50 ; S. Hook—Gelliswick, shells common in trawl, 7.5.51, (JHB).

DOSINIA LUPINUS (L.) LINCTA (Montagu) (E 159 ; BY Plate xix)
Shells only dredged off Monk Haven, 23.4.51, (EMT).

VENUS (CHIONE) OVATA (Pennant) (E 159 ; BY Plate xix)
Several in dredge half mile east of Thorn Island, 15.4.49, (RDP).

VENUS (CLAUSINELLA) FASCIATA (da Costa) (E 159 ; BY Plate xix)
Musselwick, one, 14.4.49, (RDP).

VENUS (CLAUSINELLA) STRIATULA (da Costa) (E 159 ; BY Plate xix)
Gann Flats, one above M.T.L., 8.4.49, (RDP) ; March 1955, (UB) : Black Rocks, common in sand, L.W.S.T., 28.3.48, (RDP); in sand, distribution similar to that of *Solen siliqua* ; maximum abundance 28 per sq. m. ; less abundant in muddy sand to south west, 25.4.49, (NAH).

VENERUPIS PULLASTRA (Montagu) (E 160, as *Paphia* ; BY Plate xix)
Gann Flats, Black Rocks and Dale Beach. L.W.S.T. to above L.W.N.T. Occasional.

VENERUPIS DECUSSATA (L.) FUSCA Gmelin (E 160 as *Paphia* ; BY Plate xix)
Gann Estuary, several in stiff clay below M.T.L., with *Mya arenaria*, *Barnea candida* and *Corophium volutator*, 8.9.49, (RDP). Shells in trawl S. Hook to Gelliswick, 7.5.51, (JHB).

Petricolidæ

MYSIA UNDATA (Pennant)
Shells only, Dale Beach.

Mactridæ (E 165)

SPISULA SUBTRUNCATA (da Costa) (E 165 ; BY Plate xviii)
Dale Beach, (RDP).

SPISULA ELLIPTICA (Brown) (E 166 ; W 76 ; BY Plate xviii)
Black Rocks, rare in sand, L.W.S.T., 28.3.48, (RDP) : Dale Roads in trawl, 10.10.50, (EMT).

MACTRA CORALLINA (L.) CINEREA Montagu (E 165 ; BY Plate xviii)
Black Rocks, 28.3.48, (RDP) ; 7.2.51, (NAH) : Dale Beach, 24.9.53, (GTJ). Rare in sand, L.W.S.T.

Lutrariidæ (E 166)

LUTRARIA LUTRARIA (L.) (E 166 ; BY Plate xviii)
Gann Flats, March, 1955, (UB) : Dale Beach, one, L.W.S.T., 11.4.49, (RDP).

Asaphidæ (E 163)

GARI FERVENSIS (Gmelin) (E 163 ; BY Plate 23)
Gann Flats South, 12.10.50, (EMT) ; Black Rocks, 28.3.48, (RDP). Rare in sand. L.W.S.T.

Scrobiculariidæ (E 162)

ABRA PRISMATICA (Montagu) (E 163)
Dale Beach, 28.3.48, (RDP).

ABRA ALBA (Wood) (E 163)
Dale Beach, 28.3.48, (RDP)

SCROBICULARIA PLANA (da Costa) (E 162 ; Y 255 ; BY Plate xvii)
Gann Stones, March 1956, (UB) : Gann Estuary, several up to 700 yds. below Mullock Bridge, November, 1948, (NWM) ; abundant in mud by wooden bridge, 8.4.49, (RDP).

Tellinidæ (E 161)

MACOMA BALTHICA (L.) (E 162 ; BY Plate xvii)
Gann Estuary, one, with *Scrobicularia plana*, 8.4.49, (RDP). This is a very common species on estuarine mud flats.

Tellina fabula Gmelin (E 162)
Gann Flats, 21.3.50, (JHB) : Black Rocks, 28.3.48, (RDP) ; 7.2.51, (NAH). Common in sand, L.W.M. and below, commoner than *T. tenuis*.

Tellina tenuis da Costa (E 161 ; Y 229 ; BY Plate xvii)
Gann Flats, 21.3.50, (JHB) : Black Rocks, 23.4.48 and 7.2.51, (NAH). Rare to common in sand.

Donacidæ (E 161)

Donax vittatus (da Costa) (E 161 ; W 77 ; BY Plate 23)
Shells only. Dale Beach and Broadhaven.

Solenidæ Razor shells (E 164)

Phaxas pellucidus (Pennant) (BY Plate 23)
Dale Beach, 28.3.48, (RDP) ; 24.9.53 (GTJ). Rare, L.W.S.T.

Solen marginatus Pulteney (E 164 ; BY Plate 23)
Shells only, Dale Beach.

Ensis ensis (L.) (E 165 ; Y 233 ; RY 48 ; BY Plate 23)
Gann Flats, March, 1955, 1956 (UB) : Black Rocks, small ones common in sand, L.W.S.T., 28.3.48, (RDP). Skomer—North Haven, April 1946, (UB).

Ensis siliqua (L.) (E 165 ; BY Plate 23)
The extensive bed of muddy sand near L.W.S.T., abundantly occupied by this species, stretches across Dale Sands and Gann Flats South and East, and is one of the main features of the Field Centre's marine fauna. Also in Angle Bay.

Pharus legumen major Bucquoy (E 164 ; BY Plate xvii)
Gann Flats, one, dead, 21.3.50, (JHB) : Black Rocks, one in sand, L.W.S.T., and dead shells, 7.2.51, (NAH) : Dale Beach, one, 15.9.54, (GTJ).

Hiatellidæ (E 167)

Hiatella arctica (L.) (E 168 : W 79 ; Y 171 ; BY Plate xx)
Widely distributed in crevices and *Laminaria* holdfasts. Musselwick Point, Brig Stones, Castle Beach, Gunkel, St. Bride's Haven. Skokholm—Peter's Bay, Crab Bay, North Haven, Skomer—North Haven. March, April, July, August, September.

Erodonidæ

Corbula gibba (Olivi) (=*Aloidis*) (BY Plate 23)
Off Dale Point, one in dredge, 15.8.53, (ORB).

Myidæ Clams (E 167)

Mya truncata L. (BY Plate 23)
Gann Estuary, one 500 yds. below Mullock Bridge, November 1948, (NWM) : Gann Flats, one, M.T.L., 20.9.49 (UCL) ; March 1955, (UB).

MYA ARENARIA L. (BY Plate 23)

Gann Estuary, occasional up to 600 yds. below Mullock Bridge (NWM, RDP) : Brig Stones, one, 26.4.48 (NAH). In sand or clay.

Pholadidæ (E 168)

BARNEA CANDIDA (L.) (E 168 ; Y 178 ; BY Plate xx)

Gann Flats, Gann Estuary, in localised patches in heavy mud or clay below M.T.L., (UCL, RDP).

Teredinidæ Ship-worms (E 169)

TEREDO NORVEGICA Spengler (E 169 ; BY Plate xx)

Musselwick Point, two in wreck, 14.4.49, (RDP) ; one 26.3.52. (NWM).

TEREDO NAVALIS L. (E 170 ; Y 171, 174, 180, 181 ; RY 136–8, 141, 145, 146, 151 ; BY Plate xx)

Numerous in driftwood, March 1949, (NWM). This very important species bores into marine wood-works and makes it necessary for all wooden boats operating in tropical or sub-tropical waters to be sheathed in copper. Good accounts are given in the references cited above. Attention may be directed to the fact that the shell valves, used in boring are so reduced as no longer to enclose the body. The burrow is lined by a separate calcareous tube secreted by the exposed mantle tissues. Recent control measures include the use of depth charges which kill the animals in their burrows.

Pandoridæ

PANDORA PINNA (Montagu)

Dale Roads, one, dredged, 28.8.56, (GEB).

Thracidæ

THRACIA PHASEOLINA (Lamarck)

Dale Beach, one in sand, L.W.S.T., 24.9.53, (GTJ).

Class CEPHALOPODA (H 267)

Order DECACERA Cuttlefish and squids.

Sepiidæ Cuttlefish

SEPIA ELEGANS Orbigny

Shell only, West Dale Bay (UMG)

SEPIA OFFICINALIS L. Common cuttlefish (W 93 96 ; DW 74 ; Y 240 ; RY 103, 210 ; H 274, 288 ; BY Plate xxi)

Dale Roads, one in trawl, 1 ft. long, 4.9.50, (JHB) : Castle Beach Bay, one in trawl, 29.9.50, (GTJ). SKOKHOLM—an Atlantic Seal seen with one in its mouth, 11.4.47, (T. Bagenal).

This abundant sub-littoral species ranges southwards into tropical waters and is a familiar feature of the shallow seas.

Sepiolidæ

Sepiola atlantica Orbigny (H 277; BY Plate xxi)

Gann Flats at edge of tide; two, 8.6.49; one, 6.3.50 (JHB): one, 22.8.53, (ORB): Watwick Bay, one in rock pool, 8.3.55, (JM). A beautiful little animal.

Loliginidæ Squids

Alloteuthis subulata (Lamarck) (H278)

Dale, one, Sept. 1951, (UCL).

Loligo forbesi Steenstrup (BY Plate xxi)

One from trawler off St. Govan's—Caldy Island, 19.9.52, (GTJ).

Order OCTOPODA Octopus (W 89–91; DW 96, 98; Y 122)

Octopodidæ

Eledone cirrhosa (Lamarck) (DW 76, 96; BY Plate xxi)

Dale Beach, one, L.W.S.T., 2.4.50, (NWM); one, September, 1951, (UCL): St. Ann's Head, one, 25.3.52, (NWM). Skokholm—North Haven, one, caught and held by one tentacle by a limpet. Released and kept alive for several days, 20.9.55.

The cephalopods have a very well developed mechanism which permits very rapid colour changes in many species—notably the squids. These latter are also very efficient swimmers and are believed to be extremely abundant in the open ocean.

Phylum CHÆTOGNATHA

Sagitta setosa J. Müller (BY Plate ii)

Dale, common in plankton, September 1951, (UCW).

The arrow-worms are common in the plankton of many seas and the two species common in British waters have been used at Plymouth as " biological indicators " as *S. setosa* is characteristic of North Sea waters and *S. elegans* of oceanic waters. The distribution of *S. elegans* therefore gives a measure of the penetration of rich Atlantic waters around our coasts.

Phylum KAMPTOZOA (=Polyzoa Entoprocta, E 219, 224)

Pedicillinidæ (E 224)

Pedicillina cernua (Pallas) (E 224)

Brig Stones, on *Polysiphonia*, 25.4.49; Castle Beach, on *Sertularella polyzonias*, L.W.S.T., 27.8.49; Dale Roads, frequent on polyzoa in dredge and trawl, September 1949, (GO).

Barentsia gracilis (Sars) (E 224)
Castle Beach, rare on red weeds, 13.9.54, (UCW).

Loxosomella phascolosomata (Vogt)
Gann Stones, on *Golfingia*, 28.3.38, (RDP).

Phylum **POLYZOA** s. str. (=Polyzoa Ectoprocta, E.220 ; H.179, 190)

Order CYCLOSTOMATA

Crisiidæ (E 223)

Crisidia cornuta (L.) (E 223)
Castle Beach, common, L.W.S.T., 11.4.49, (RDP).

Crisia eburnea (L.) (E 223)
Slip Pier Beach, on red algae in *Fucus serratus* zone, 21.3.49, (DWS) : Great Castle Head, on red algae in pools, 15.9.49, (GO).

Crisia denticulata (Lamarck)
Castle Beach, (RDP, JHB).

Lichenoporidæ

Lichenopora hispida (Fleming)
Castle Beach, two colonies, L.W.S.T., 11.4.49, (RDP).

Order GYMNOLAEMATA

Sub-Order CHEILOSTOMATA

Aeteidæ

Aetea anguina (L.)
Skokholm—North Haven, Peter's Bay, Little Bay, South Haven, August 1950, (RH). On *Chondrus crispus*, *Halecium halecinum*, *Scrupocellaria reptans*, *Laminaria* holdfasts, other weeds and in pools.

Aetea sica (Hincks) (=*recta*)
Skokholm—On other polyzoa.

Scrupariidæ (=Eucrateidæ)

Scruparia chelata (L.)
Castle Beach, luxuriant growths on *Lomentaria*, L.W.S.T., 27.8.49, (GO). Skokholm—North Haven, Peter's Bay, Little Bay, Dumbell Bay. Common, August 1950, on *Chondrus*, holdfasts and stripes of *Laminaria*, *Aglæophenia*, *Tubularia*, *Crisia* and *Bugula*, (RH).

Membraniporidæ (E 221)

Membranipora membranacea (L.) (E 211 ; Y 38, 139 ; RY 60 ; (BY Plate iii).
Dale Roads, (RDP).

Electra pilosa (L.)
Gann Stones, March 1956 (UB); Gann Flats, Gateholm, 28.3.48, (RDP).

Flustridæ (E 221)

Flustra foliacea (L.) (E 221; BY Plates iii and xxv)
Lobster pots at Skokholm, 26.6.50, (from Mr. F. Sturley, JHB).

Cellariidæ

Cellaria fistulosa Hincks
Skokholm—on *Maia squinado* and common on *Nemertesia antennina*, 26.6.50, (from Mr. F. Sturley, JHB).

Scrupocellariidæ (E 220 as Cellulariidæ)

Scrupocellaria reptans (L.) (E 220)
Gann Stones, March, 1956, (UB): Brig Stones, common, L.W.S.T., 25.4.49, (GO): Castle Beach, common under ledges, L.W.S.T., 11.4.49, (RDP). Skokholm—North Haven, Peter's Bay, Little Bay. Occasional on weeds, holdfasts, *Aglaophenia* and rocks. Common below L.W.S.T. at Little Bay, August 1950, (RH).

Bicellariidæ (E 221)

Bugula turbinata Alder (E 221; BY Plate iii)
Musselwick Point, rare, 28.3.48, (RDP): Dale Point, abundant, 28.7.49; Castle Beach, rare, 29.7.49, (GO). On rocks and under boulders and ledges.

Schizoporellidæ

Schizoporella hyalina (L.)
Dale Road, trawled on *Laminaria saccharina*, 8.4.49, (RDP).

Hippoporinidæ

Cryptosula pallasiana (Moll) (=*Lepralia*)
Musselwick Point, Slip Pier Beach, common under boulders, L.W.S.T., 28.3.48, (RDP).

Umbonulidæ

Umbonula verrucosa (Esper.) (E 222)
Castle Beach, abundant below M.T.L., 11.4.49, (RDP).

Order CTENOSTOMATA

Alcyonidiidæ (E 223; BY Plate iii)

Alcyonidium gelatinosum (L.) (E 223)
Musselwick, 28.3.48, (RDP): Slip Pier Beach, abundant, L.W.M., September 1948: Gateholm, 28.3.48, (RDP): Monk Haven, abundant, L.W.M., September 1948: Skokholm—one large colony on lobster pot, 2.9.50, (from Mr. F. Sturley, JHB).

ALCYONIDIUM HIRSUTUM (Fleming) (E 224)

Slip Pier Beach, one colony on red alga, 24.9.50, (EMS) : Dale Fort Beach, 28.3.53 : West Dale Bay, two colonies washed up, 27.6.50, (JHB).

Flustrellidæ (E 224)

FLUSTRELLA HISPIDA (Fabricius) (E 224 ; Y 141)

Gann Stones, March 1956, (UB) : Dale Fort Beach, very abundant on *Gigartina stellata* and *Fucus serratus*, 28.4.50, (JHB).

Vesiculariidæ

VESICULARIA SPINOSA (L.)

Dale Roads, on stone in dredge, 19.9.49, (GO).

BOWERBANKIA IMBRICATA (Adams)

Brig Stones, on *Ascophyllum*, 29.6.50, (JHB).

Phylum ECHINODERMATA (E 15, 227-8 ; H 193)

The radial symmetry of the echinoderms, associated with a complex organisation which includes such unique morphological features as hydraulic tube feet, pedicillariae, movable spines, subdermal skeleton, a nerve system with multiple centres of control, etc., marks this entirely marine phylum as one of special interest. In addition, various species are adapted, somewhat unexpectedly, to the widest range of habitats from the oceanic abyss and the plankton to the intertidal zone, including mud, sand and rocky areas ; and to such diverse habits as a sessile or free living life ; to life on rock and on or in sand or mud ; to ciliary feeding, detritus-eating or predation. Their larvae are mainly planktonic and are extremely characteristic.

Class CRINOIDEA Sea-lilies (E 228)

Antedonidæ (E 228)

ANTEDON BIFIDA (Pennant) Rosy feather star (E 228 ; Y 37 ; RY 64 ; BY Plate 26)

Occasional, L.W.S.T., Musselwick, Slip Pier Beach, Castle Beach, Great Castle Head, Monk Haven. SKOMER—Mew Stone. March, April, September. None present at Dale Point, 25.3.51, (NWM).

Class ASTEROIDEA Star-fish (E 228-9)

Order PHANEROZONIA

Astropectinidæ

ASTROPECTEN IRREGULARIS (Pennant) (DW 100 ; BY Plate 25)

From trawler, St. Govan's—Caldy Island, one, 19.9.52, (GTJ). A sand-burrowing sub-littoral species.

Order SPINULOSA

Asterinidæ (E 230)

Asterina gibbosa (Pennant) (E 230 ; DW 42 ; Y 158 ; BY Plate 25)

Rare in Dale Bay (Slip Pier Beach, 28.3.49, DWS), but common outside—Castle Beach, Watwick Bay, Mill Bay, Great Castle Head, West Dale Bay, Angle Bay. L.W.M., March, April, May, September.

Solasteridæ (E 230 ; W 97)

Solaster (Crossaster) papposus (L.) (BY Plate 24)

Occasional in dredge—off Watch House Point, Monk Haven, Dale Point and Llangwm. January, July, September.

Echinasteridæ

Henricia sanguinolenta (O. F. Müller) (E 231 ; T 167 ; BY Plate 24)

Single specimens from Slip Pier Beach, Dale Point, Watwick Bay. Skokholm—South Haven (two). Skomer—Mew Stone (two). March, April, July, September.

Order FORCIPULATA

Asteriidæ (E 229, Y 164)

Asterias rubens L. Common star-fish (E 229 ; W 99 ; DW 102 ; Y 166 ; RY 29 ; H 191 ; BY Plate 24)

Gann Stones, Gann Flats, Black Rocks, Wooltack Point, Angle Bay, off S. Hook (dredged), off St. Govan's and Caldy Island (trawled). Skokholm—Crab Bay, Wallsend Bay. Skomer—Mew Stone, North Haven, Midland Isle. Widespread in small numbers. Common at Gann Stones on 20.3.50, but not present two weeks earlier, (JHB). L.W.S.T. and below.

Marthasterias glacialis (L.) (E 230 ; DW 50 ; Y 167 BY Plate 24)

Occasional specimens from L.W.S.T. at Castle Bay, Great Castle Head, West Dale Bay, Skokholm—Crab Bay and Skomer—Mew Stone. Also from the sub-littoral, Hog Bay on Skokholm and from trawler St. Govan's—Caldy Island. Up to 15½ ins. across. Spawning, 5.4.50, (JHB).

Class OPHIUROIDEA Brittle-stars (E 231–3)

Order OPHIURAE

Ophiotrichidæ (E 233)

Ophiothrix fragilis (Abildgaard) (E 233 ; W 102, 123, 125 ; DW 108 ; Y 159 ; H 190 ; BY Plate 26)

Widespread and fairly common. Gann Stones, Dale Beach, Point Wood Beach, Slip Pier Beach, Dale Point, Castle Beach, Great Castle Head, Martin's Haven, Dale Roads (dredge). SKOKHOLM—Crab Bay, Hog Bay, South Haven. SKOMER—North Haven, Mew Stone, L.W.M. and below. March, April, July, September.

Ophiocomidæ (E 234)

OPHIOCOMINA NIGRA (Abildgaard) (E 234 ; W 125 ; DW 108 ; RY 64 : BY Plate 26)

Martin's Haven, one, Spetember 1948. SKOKHOLM—Hog Bay, two, 27.3.52, (ECJ) ; 14.9.54, (HJM). SKOMER—North Haven, three, April 1956, (UB).

Ophiactidæ (E 234)

OPHIACTIS BALLI (Thompson) (E 234)

SKOKHOLM, 12.4.48, (BW)

Amphiuridæ (E 235)

AMPHIURA CHIAJEI Forbes

Dale Beach, 26.7.50, (MRY) ; 28.3.53, (MRY) ; SKOKHOLM—near the Stack, 15.8.47, (CT).

ACROCNIDA BRACHIATA (Montagu) Burrowing brittle-star (E 235 ; DW 138 ; BY Plate 26)

Gann Flats, March 1955, 1956, (UB) : Black Rocks, in sand, L.W.S.T., 28.3.48, (RDP) ; September 1948, (UCL) : Angle Bay, April, 1953, (UB).

AMPHIPHOLIS SQUAMATA (Delle Chiaje) (E 236 ; BY Plate 26)

Gann Stones, Gann Flats, Dale Beach, Slip Pier Beach, Gunkel, Great Castle Head, Martin's Haven, Dale Roads (dredge), Castle Beach Bay (dredge). SKOKHOLM—Crab Bay, Peter's Bay, South Haven. Under stones, in pools, in *Laminaria* holdfasts. Common.

Ophiolepidæ (E 236 ; BY Plate 26)

OPHIURA TEXTURATA Lamarck

Dale Beach, Castle Beach, 28.3.48, (RDP) : dredged off Thorn Island, 15.4.49, (GO) ; off Watch House Point, 1.9.49, (GO); in Dale Roads, 28.3.48, (RDP) ; 31.3.53, (MRY). Occasional.

OPHIURA ALBIDA Forbes

Gann Flats, March 1955, (UB) : Dale Beach, Castle Beach, 28.3.48. (GO) : dredged off Thorn Island, 15.4.49, (GO) ; off Watch House Point, 1.9.49, (GO) ; in Dale Roads, 28.3.48, (RDP). Common.

Class ECHINOIDEA Sea urchins (E 237)

Order DIADEMATOIDEA

Echinidæ (E 238)

Psammechinus miliaris (Gmelin) (E 238 ; W 105 ; H 190 ; BY Plate 27)

From Musselwick Point to Dale Point, Castle Beach, Watwick Bay, Stack Rock, Dale Roads (dredged). Skokholm—Crab Bay, South Haven. Skomer—North Haven, Mew Stone. In small numbers near L.W.M. Common at Gann Stones and Castle Beach, 12.4.49, and at Stack Rock, 25.9.53. The Stack Rock specimens included some larger than Mortensen's maximum of 50 mm. and the Dale Bay specimens often have on them the worm, *Flabelligera affinis.*

Echinus esculentus L. (E 239 ; W 104 ; DW 20 ; Y 165, 168 ; RY 39, 211, 253 ; BY Plate 27)

Martin's Haven, abundant on vertical rock faces up to 5 feet above L.W.E.S.T., April 1946, (RDP) : Dale Roads, one in lobster pot, March 1949, (NWM). Skokholm—one in lobster pot, 24.7.56, (from Mr. H. Sturley, JM).

Order SPATANGOIDEA

Spatangidæ

Echinocardium cordatum (Pennant) (E 241 ; DW 130 ; Y 238–9 ; RY 56 ; BY Plate 27)

Common in localised patches, burrowing in sand near L.W.S.T. Dale Sands, Gann Flats South and (possibly) East. With *Montacuta ferruginosa.*

Class HOLOTHUROIDEA Sea Cucumbers (E 241)

Order DENDROCHIROTA

Cucumariidæ

Cucumaria saxicola Brady and Robertson (E 242 ; DW 20 ; Y 36 ; RY 201 ; BY Plate 28)

Musselwick Point, Point Wood Beach, Slip Pier Beach, Martin's Haven. Skomer—North Haven. March, April, September. In small numbers, L.W.S.T.

Cucumaria normani Pace (E 242 ; BY Plate 28)

Musselwick Point, one, 28.3.48, (RDP); several, 3.4.50 ; three, 24.3.51, (NWM) ; March 1955, (UB).

Thyone fusus (O. F. Müller)

Slip Pier Beach, one, 3 cm. long, 3.4.55, (JM).

Order APODA

Synaptidæ (E 242 ; Y 240 ; H 190)

LEPTOSYNAPTA INHAERENS (O. F. Müller) Burrowing sea cucumber (E 243)

Common in localised patch of muddy gravel, Gann Stones, recorded in March or April, 1948, 50, 51, 52, 55, 56, (RDP, NWM, UB).

Phylum **CHORDATA** (E 15)

Sub-Phylum **HEMICHORDATA**

Class ENTEROPNEUSTA (E 259 ; H.196)

Ptychoderidæ

SACCOGLOSSUS CAMBRENSIS Brambell and Cole (BY Plate 28)

Common in muddy sand, L.W.S.T., Dale Sands, extending towards Musselwick. First noted by RDP and GTJ, 13.4.49, and subsequently recorded regularly.

Sub-Phylum **CEPHALOCHORDATA**

AMPHIOXUS (BRANCHIOSTOMA) LANCEOLATUS (Pallas)

Dale Roads plankton, several post-larvae, 1.5 cm. long, 10.9.56, (WALE)

Sub-Phylum **TUNICATA** Sea squirts (E 15, 246, 248)

Class ASCIDIACEA

Order ENTEROGONA

Sub-Order APLOUSOBRANCHIATA

Clavellinidæ (=Polycitoridæ, E 253)

CLAVELINA LEPADIFORMIS (O. F. Müller) (E 253 ; Y 40 ; BY Plate 29)

Musselwick, groups in mid-littoral pools, 16.6.50, (JHB) : Brig Stones, under rocks, also small specimens with only four rows of stigmata, 26.7.50, (MRY).

Polyclinidæ (=Synoicidæ, E 253-4)

MORCHELLIUM ARGUS (Milne Edwards)

Slip Pier Beach, common under stones at *Fucus serratus* level, 7.6.49, (JHB).

Sub-Order PHLEBOBRANCHIATA

Cionidæ (E 252)

CIONA INTESTINALIS (L.) (E 253 ; W 107 ; BY Plate 29)
Castle Beach, two, 11.4.49, (RDP) ; frequent, 28.7.49, (GO) : West Dale Bay, one, 14.9.50, (EMT). L.W.S.T.

Corellidæ (=Rhodosomatidæ, E 251)

CORELLA PARALLELOGRAMMA (O. F. Müller) (E 251)
Black Rocks, under stones, September 1948, (UCL).

Ascidiidæ (E 251)

ASCIDIELLA ASPERSA (O. F. Müller) (BY Plate 29)
Occasional specimens from Musselwick Point, Black Rocks, Point Wood Beach, Castle Beach, Gateholm and Dale Roads. March, September. L.W.M. and below.

ASCIDIA MENTULA O. F. Müller (BY Plate 29)
Musselwick Point, Black Rocks, Castle Beach, Dale Roads (dredge). L.W.M. and below. Occasional.

ASCIDIA CONCHILEGA O. F. Müller
Musselwick, one, March 1948 (RDP) ; Brig Stones, 26.7.50 ; Dale Roads, dredge, 31.3.53 (MRY). Under stones.

Order PLEUROGONA

Sub-Order STOLIDOBRANCHIATA

Styelidæ (E 249, includes Botryllidæ, E 250)

DENDRODOA GROSSULARIA (van Beneden) (E 250 ; W 107 ; Y 170 ; BY Plate 29)
Castle Beach, good growth in small cave, 11.4.49, (RDP) : Dale Roads, dredge, 31.3.53, (MRY) : the main Milford Haven channel, widespread on stones and shells, releasing larvae ,18.9.53, (EMS).

BOTRYLLUS SCHLOSSERI (Pallas) (BY Plate 29)
Musselwick Point, Gann Stones, Dale Beach, Frenchman's Path, Slip Pier Beach, Dale Fort Beach, Gateholm, Stack Rock, Angle Bay. SKOKHOLM—Peter's Bay, Crab Bay, North Haven. Occasional to abundant. March, May, June, August, September. Largest colonies recorded in May, June, July. A Musselwick colony was brick red in colour and had no stellate pattern. The colour of this species is variable.

BOTRYLLOIDES LEACHI (Savigny) (BY Plate 29)
Musselwick, Gann Estuary, Dale Beach, Slip Pier Beach, Angle Bay. Occasional, March, September. Stack Rock, abundant, 7.5.51.

Molgulidæ (E 249)

MOLGULA OCULATA Forbes

Dale Beach, a few lying free, L.W.S.T., September 1948, (RDP).

The genera *Didemnum*, *Amaroucium* and *Oikopleura* have been tentatively recorded.

Sub-Phylum **VERTEBRATA**

Class SELACHII Dog fishes and sharks (Elasmobranchs)

Order PLEUROTREMATA

Isuridæ (TJ 310 Lamnidæ)

CETORHINUS MAXIMUS (Gunnerus) Basking shark (TJ 314, Plate 122)

Watwick Bay, 20.7.51 ; Dale Roads, 28.8.51, (JHB).

Scylliorhinidæ (TJ 317)

SCYLLIORHINUS STELLARIS (L.) Greater or larger spotted-dogfish or nursehound (TJ 318, Plate 131 ; DW 94)

In lobster pots, one, 18.6.61, (EMT) ; St. Ann's, two, 5.10.51, (JHB).

SCYLLIORHINUS CANICULUS (L.) Lesser spotted or common dogfish, rough dog (TJ 318 Plate 131 : DW 36, 112)

Occasionally taken in Dale Roads. Egg cases abundant on *Halidrys*, L.W.S.T. at Musselwick Point, two hatched, October 1948, (GDW).

Carcharinidæ

EUGALEUS GALEUS (L.) Tope (TJ 308 Plate 129)

Dale Roads, one netted by Mr. F. Sturley, November 1956, (JM).

Squalidæ

SQUALUS ACANTHIAS L. Piked dogfish or spur dog (TJ 321 Plate 131)

Martin's Haven, two dead on beach, 5.1.51, (JHB).

Squatinidæ

SQUATINA SQUATINA (L.) Monk or angel-fish (TJ 328 Plate 127; DW 52)

Dale Roads in nets, 9.9.50 ; 25.9.51, (JHB).

Order HYPOTREMATA

Torpedinidæ

TORPEDO NOBILIANA Bonaparte Electric ray (TJ 329 Plate 128 ; DW 52)

Dale Roads in trawl ; September 1948, (RDP): one male about 40 lbs., July 1952, (JHB).

Rajidæ (TJ 330-1 ; W 119)

RAJA CLAVATA L. Thornback ray or roker (TJ 338 Plate 134 ; C 197 ; DW 36)

Dale Roads, frequent in trawl up to 10½ lbs., 1948 to 1951. With *Pontobdella*, 21.7.49, (GO).

RAJA MONTAGUI Fowler Spotted or homelyn ray (TJ 339 Plate 138)

Dale Roads in trawl, April 1949, (RDP) ; 23.7.49, (GO). Off St. Govan's—Caldy Island, 19.9.52, (GTJ).

RAJA MICROOCELLATA Montague, Painted or small eyed ray (TJ 337 Plate 137)

Dale Roads, trawl, 10.10.50, (EMT).

RAJA BATIS L. Common skate (TJ 334 Plate 133)

From trawler, off St. Govan's—Caldy Island, 19.9.52, (GTJ).

Class PISCES

Sub-Class NEOPTERYGII

Order ISOSPONDYLI

Clupeidæ (TJ 255)

CLUPEA HARENGUS L. Herring (TJ 256 Plates 106, 109 ; C 236–243 ; DW 150 ; RY 270, 320, 341)

Dale Roads in nets, September, November, December, January. Heavy catches at Llangwm, 27.3.52, (JHB). A very early one 11 ins. long, 29.8.56, (JHB).

CLUPEA SPRATTUS L. Sprat (TJ 261 Plate 117)

Gann Flats, coming in with the tide, 22.8.53, (ORB).

ALOSA FINTA (Cuvier) Twaite Shad (TJ 264 Plate 104)

Point Wood Beach, in net, one, 10 in. long, 4.9.54, (from Mr. F. Sturley, JHB).

Salmonidæ (TJ 215)

SALMO SALAR L. Salmon (TJ 215 Plates 87–92 ; C 199–201)

Dale, occasional in nets, 5.9.51, (JHB).

SALMO TRUTTA L. Sea, brown or salmon trout (TJ 227, Plates 93–95)

Taken fairly regularly in nets in Dale Bay : up to 1½ lbs. Some of this species stay in fresh water as brown trout, some migrate to feed in estuaries, others migrate to sea for feeding and become sea or salmon trout.

Order APODES

Anguillidæ Eels (E 263 ; TJ 266)

Anguilla anguilla (L.) Common eel (E 263 ; TJ 267 Plate 111 ; C 201–3 ; RY 87, 93 ; BY Plate xxii)

The Leptocephalus larva drifts across the Atlantic from the Sargasso Sea and changes into a glass eel, at about 3 years of age, and may be taken on the shore in March and April as it makes for fresh water. Some stay (as yellow eels) and grow on the shore, particularly in or near estuaries. Others go into fresh water streams or ponds and return years later to the sea as silver eels, to spawn in the Sargasso sea. Glass and yellow eels have been recorded in various parts of the Dale peninsula, at Angle Bay and on Skokholm.

Congridæ

Conger conger (L.) Conger eel (E 263 ; TJ 273 Plate 112 ; BY Plate xxii)

Small specimens live on the shore and have been recorded up to 14 ins. long from Gann Stones, Black Rocks, Brig Stones and Gateholm. Occasionally up to 20 lbs. in lobster pots.

Order SOLENICHTHYES

Syngnathidæ Pipe fishes (E 264 ; TJ 208)

Entelurus aequoreus (L.) Snake or ocean pipe fish (E 265 ; TJ 209 Plate 94 ; DW 92 ; Y 113 ; BY Plate xxii)

Musselwick, one, 25.9.49, (UCW) : Dale Roads, one, dredge, 17.9.49, (UCL).

Nerophis lumbriciformis Pennant Worm pipe fish (E 265 ; TJ 210 Plate 84 ; BY Plate xxii)

All rocky shores in Dale Bay (except Black Rocks), Castle Beach, Watwick Bay, Gateholm, Martin's Haven, Skokholm and Skomer. The males carry the eggs and these have been recorded in March, April and August. The August ones were hatching.

Nerophis ophidion (L.) Straight nosed pipe fish (E 265 ; TJ 209 Plate 84)

Castle Beach, 23.3.52 ; 26.3.52, one 18 ins. long, (JHB).

Syngnathus acus L. Great pipe fish (E 265 ; TJ 209 Plate 84 ; BY Plate xxii)

Dale Beach, one on *Laminaria*, September 1948, (RDP).

Siphonostoma typhle (L.) Broad nosed pipe fish (E 265 ; TJ 208 Plate 84)

Gann Flats, one, 23.9.49, (UCL).

Order ANACANTHINI

Merlucciidæ

MERLUCCIUS MERLUCCIUS (L.) Hake (TJ 157 Plate 61)
From trawler St. Govan's—Caldy Island, 19.9.52, (GTJ).

Gadidæ (E 266 ; TJ 131-2)

GADUS CALLARIAS L. Cod (TJ 134 Plate 55)
Dale Roads, in trammel nets and on lines, September 1950, 1.1.51 : August, September, 1952, (JHB).

GADUS LUSCUS L. Bib or pout (TJ 138 Plate 54)
Dale Roads in trammel, trawl and herring nets: September 1950; January, September, 1951, (JHB). From trawler St. Govan's—Caldy Island, 19.9.51, (GTJ) : SKOKHOLM—South Bay, August, 1955.

GADUS MERLANGUS L. Whiting (TJ 150 Plate 57)
Dale Roads, in herring nets, January 1952, (JHB) : from trawler St. Govan's—Caldy Island, 19.9.52. (GTJ).

GADUS VIRENS L. Coal fish or saithe (TJ 149 Plate 58)
Musselwick Point, in pollack nets, December 1950 ; January 1951 : SKOKHOLM—off Crab Rocks on spinner, 5.7.52, (JHB).

GADUS POLLACHIUS L. Pollack (TJ 152 Plate 57 ; DW 72)
Gann Estuary, one, 23.7.49, (GO) : Dale Roads, in trawl, trammel and herring nets, July 1949, (GO) ; January, September, 1951 (JHB).

ONOS MUSTELUS (L.) Five-bearded rockling (E 266 ; TJ 163 Plate 63)
Common all over Dale Bay, Castle Beach, Watwick Bay, Gateholm, Angle Bay, Dale Roads (trawl) ; SKOKHOLM—Crab Bay ; SKOMER—North Haven. March, April, July, September.

ONOS MEDITERRANEUS (L.) Three-bearded rockling (E 266 ; TJ 162 Plate 63 ; DW 94 ; YB Plate xxiii)
The intertidal species is probably *O. mediterraneus* and the deep water one *O. tricirratus* (Bloch).

Abundant at Gann Stones, also recorded at Dale Beach, Slip Pier Beach, Watwick Bay. SKOKHOLM—Crab Bay, South Haven, Peter's Bay. SKOMER—North and South Havens. March, April, July, September.

Order ZEOMORPHI

Zeidæ

ZEUS FABER L. John Dory (TJ 82 Plate 31 ; W 111 : DW 72, 88, 90)
Dale Roads, in trawl, two each 1 ft. long, 27.9.50, (GTJ).

Order PERCOMORPHI

Serranidæ (E 279)

MORONE LABRAX (L.) Bass (E 279 ; TJ 34 Plate 2)
Dale Roads, in trawl, trammel and herring nets, and by beating in the Gann. January, September 1951, (JHB) ; 28.9.50, (GTJ).

Carangidæ

TRACHURUS TRACHURUS (L.) Horse mackerel (TJ 78 Plate 25).
From trawler, off St. Govan's—Caldy Island, 19.9.52, (GTJ).

Mullidæ Mullet

MULLUS SURMULETUS L. Red mullet (TJ 37 Plate 3 ; DW 84)
Dale Roads, one in herring nets, 6.9.51, (JHB).

Labridæ Wrasse (E 278, TJ 127, BY Plate 30)

LABRUS BERGYLTA Ascanius Ballan wrasse (E 278 ; TJ 128 Plate 52 ; DW 128 ; Y 112 ; BY Plate 30)
Brig Stones, Musselwick, Stack Rock, Dale Roads (trawl). Up to 13½ ins. long. March, May, July, September.

LABRUS OSSIFAGUS L. (=*L. mixtus*) Striped, red or cuckoo wrasse (TJ 129 Plate 52)
Musselwick, one, 2 ins. long, 7.3.50, (JHB).

CRENILABRUS MELOPS (L.) Corkwing, conner, gilt-head, Baillon's wrasse or sea partridge (E 278 ; TJ 129 Plate 52 ; BY Plate 30)
Musselwick, Gann Flats, Brig Stones. March, April, September.

CTENOLABRUS RUPESTRIS (L.) Gold-sinny (E 279 ; TJ 130 ; DW 70 ; BY Plate 30)
Musselwick, one, 25.9.49, (UCW).

Ammodytidæ Sand-eels (E 266 ; TJ 165)

The systematics of the genus *Ammodytes* are involved.

AMMODYTES LANCEOLATUS Lesauvage Greater sand eel (E 266 ; TJ 166 Plate 64 ; Y 107 ; BY Plate xxiii)
Monk Haven, sand at L.W.M., September, 1948 and 1949, (UCL) : Marloes Sands, 7.9.56, (JM).

AMMODYTES TOBIANUS L. Lesser sand eel (E 266 ; TJ 166 Plate 64) Æ
Gann Flats, two among *Arenicola*, 28.3.48, (RDP) ; March 1955, (UB) : Dale Beach, one, L.W.S.T., 13.4.49 ; Gateholm, 28.3.48, (RDP). SKOMER—South Haven, two, April 1946, (UB).

Scombridæ

SCOMBER SCOMBRUS L. Mackerel

Mackerel usually appear about July 10th (Marloes Fair) in Dale waters and have been recorded in September 1948, 1950 and 1951. But early records were obtained off Skokholm on 5.7.52 and 27.5.56, (JHB).

Gobiidæ Gobies (E 271 ; TJ 87)

GOBIUS NIGER L. Black goby (E 272 ; TJ 91 Plate 42 ; BY Plate 32)

Dale Beach, one, 23.9.49, (UCW) ; one, 2.4.50, (NWM).

GOBIUS PAGANELLUS L. Rock goby (E 272 ; TJ 92 Plate 29 ; DW 90 ; Y 97 ; BY Plate 32)

Common at Musselwick Point and Black Rocks ; occasional at Point Wood Beach, Dale Fort Beach and Castle Beach. March, July, August, September.

GOBIUS FLAVESCENS Fabricius (=*ruthensparri* Euphrasen) Spotted goby (E 272 ; TJ 94 ; BY Plate 32)

Musselwick, in shoals at L.W.M., 25.9.49, (UCW) : Brig Stones, one, 2.4.50, (NWM) : West Dale Bay, one, 27.9.49, (UCW).

GOBIUS MINUTUS Pallas Common or sand goby (E 273 ; TJ 93 ; Y 123).

Common in Gann Saltings and Gann Estuary to above Mullock Bridge. Occasional, Gann Flats, Black Rocks and Castle Beach. March, April, September, November.

Trachinidæ

TRACHINUS VIPERA Cuvier and Valenciennes (TJ 60 Plate 15 ; BY Plate xxiii)

Marloes Sands, two in sand, L.W.S.T., 7.9.56, (JM).

Callionymidæ (TJ 98)

CALLIONYMUS LYRA L. Dragonet (TJ 99 Plate 34)

Dale Roads, one in dredge, 28.3.48, (RDP) ; one female in trawl, 20.9.55, (GTJ).

CALLIONYMUS MACULATUS Rafinesque Spotted dragonet (TJ 100 Plate 36)

Dale Roads, several juveniles in trawl (det. N. B. Marshall), 19.9.52, (JHB).

Blennidæ Blennies (E 267 ; TJ 108)

BLENNIUS GATTORUGINE Bloch Tompot blenny or gattorugine (TJ 110 Plate 44 ; W 112 ; Y 123 ; BY Plate 31)

Musselwick, one, (det. British Museum), 7.3.50, (JHB) : Brig Stones, one, 2.4.50, (NWM) : Slip Pier Beach, 28.3.48, (RDP). SKOMER—South Haven, one, April 1946, (UB).

Blennius montagui Fleming (=*B. galerita*) Montagu's blenny (E 268 ; TJ 111 Plate 45 ; BY Plate 31)

Occasional ; Dale Beach, Castle Beach, Watwick Bay, Great Castle Head, Monk Haven. Skoholm—Peter's Bay. June to September.

Blennius ocellaris L. Butterfly blenny (E 268 ; TJ 111 Plate 44 ; DW 126)

Slip Pier Beach, occasional, 28.3.48, (RDP). Skokholm—Crab Bay, one, 12.4.48, (HB).

Blennius pholis L. Common blenny or shanny (E 268 ; TJ 112 Plate 45 ; W 113 ; DW 70 ; RY 24 ; BY Plate 31)

In pools up to H.W.N.T. Common and widespread. Records include almost every rocky shore in the area. But not the Gann Flats and Gann Estuary.

Pholididæ

Pholis gunellus (L.) (=*Centronotus*) Butterfish or gunnel (E 269 ; TJ 114 Plate 49 ; Y 123 ; RY 99 ; BY Plate 31)

Common at Musselwick (one guarding eggs which hatched on collection, 28.3.48, RDP) : occasional, Dale Beach to Dale Fort Beach, Castle Beach, Watwick Bay and Angle Bay. Skomer—North Haven. March, April, July, November.

Mugilidæ Grey mullets (TJ 122)

Mugil labrosus Risso (= *M. chelo*) Thick-lipped grey mullet. (TJ 123 Plate 50)

Dale Roads in Mr. F. Sturley's trammel nets, up to 6 lbs., September, 1950, 1951, January 1951 ; by beating in the Gann, good catches 20 and 21.1.51, (JHB).

Mugil capito Cuvier Thin-lipped grey mullet (TJ 123)

Gann Estuary, shoals, August 1950, (GO, NWM).

Order SCLEROPAREI

Triglidæ Gurnards (E 274 ; RY 94)

Trigla lucerna L. Tub-fish, yellow or sapphirine gurnard (E 275 ; TJ 50 Plate 13)

Dale Bay, in trawl and trammel, September 1950 and 1951, (JHB) : from trawler off St. Govan's and Caldy Island, 19.9.52, (GTJ).

Cottidæ (E 275)

Cottus scorpius L. Father lasher or short-spined sea scorpion (E 276 ; TJ 47 Plate 10)

Occasional in pools, L.W.M., Castle Beach, Great Castle Bay and Dale Roads (trawl). March, September.

Cottus bubalis Euphrasen Long-spined sea scorpion (E 276; TJ 48 Plate 8; DW 120; Y 97; BY Plate 32)

Occasional, Musselwick Point, Watwick Bay and Angle Bay.

Cyclopteridæ (E 276)

Cyclopterus lumpus L. Lumpsucker (E 276; TJ 101 Plate 39, 41; W 114; Y 112; BY Plate 30)

Dale Roads, one in trawl 28.7.49, (GO): one, 1 in. long, in *Laminaria* from buoy, 17.9.49, (UCL). Skokholm—one dead in South pond, 2.9.56.

Liparididæ (E 277)

Liparis montagui Donovan Montagu's sea-snail (E 277; TJ 105 Plates 38, 53; Y 103; BY Plate 30)

Slip Pier Beach, one, L.W.S.T., 28.3.48, (RDP): Watwick Bay, one, 24.3.52, (NWM): Dale Roads, (RDP): Angle Bay, April 1953, (UB).

Gasterosteidæ Sticklebacks (E 264)

Spinachia spinachia (L.) Fifteen spined stickleback (E 264; TJ 125 Plate 36; DW 78; BY Plate 31)

Occasional, Gann Stones, Gann Mouth, Angle Bay and Dale Roads (trawl). March, April. One had tubercles instead of spines, 7.3.50, (JHB).

The common fresh-water three-spined stickleback, *Gasterosteus aculeatus*, is often found in estuaries and in the sea but has not yet been recorded here.

Order HETEROSOMATA Flat-fish

Bothidæ

Scophthalmus maximus (L.) Turbot (TJ 200 Plate 77; BY Plate xxiv)

Dale Roads, trawl, up to 18 ins. long; 4.11.50; 7.5.51; 25.9.51; 26.3.52, (JHB).

Scophthalmus rhombus (L.) Brill

Dale Roads, trawl, one, April 1949, (RDP); one $7\frac{3}{4}$ ins. long, 1.11.50, (JHB).

Pleuronectidæ (E 273-4; TJ 169)

Flat fish can change colour to match the bottom on which they lie (RY 181, 183).

Limanda limanda L. Dab (E 274; TJ 185 Plate 71; Y 113)

Dale Roads, trawl, several, April 1949, (RDP); common during September 1950, (JHB).

PLEURONECTES PLATESSA L. Plaice (E 274 ; TJ 171 Plate 65 ; W 116 ; C 233–4 ; DW 86, 117 ; RY 320, 321 ; BY Plate xxiv)

Dale Roads, trawl and trammel, up to 18 ins. long ; September 1948, (RDP) ; September 1950, (common) ; November 1950 ; January, April, 1951, (JHB).

PLATICHTHYS FLESUS (L.) Flounder or fluke (E 274 ; TJ 187 Plate 72 ; BY Plate xxiv)

Dale Roads, trawl and trammel, up to 3 lbs. ; April 1949, (RDP) ; September 1949 ; January 1951 : Gann Estuary, small specimens 400 yds. above Mullock Bridge with fresh water fauna, in salinity less than 0.7‰, 27.3.52, (NWM).

The young of the flounder are known to feed in estuaries and even to penetrate right into fresh water.

ZEUGOPTERUS PUNCTATUS (Bloch) Top-knot (TJ 205 Plate 82 ; BY Plate xxiv)

Gunkel, one in rock pool, 18.9.55, (GTJ).

Soleidæ (TJ 193 ; W 117)

SOLEA SOLEA (L.) Sole, common or Dover sole (TJ 195 Plate 76 ; DW 86)

Black Rocks, two in sand, L.W.S.T., 28.3.48, (RDP) : Dale Roads, in dredge, trawl and trammel up to 10 ins. long ; 28.3.48, (RDP) ; September 1950, 1951, (JHB).

BUGLOSSIDIUM LUTEUM (Risso) (=*Solea lutea*) Solenette (TJ 198 Plate 80)

Gann Flats, 1 in. long at edge of tide, 26.4.49, (JHB).

Order XENOPTERYGII

Gobiesocidæ (E 270 ; TJ 106-7)

LEPADOGASTER GOUANII Lacépède Cornish sucker (E 271 ; TJ 107 Plate 40 ; Y 80, 103 ; BY Plate xxiii)

Abundant on SKOKHOLM—Crab Bay and on Skomer—North Haven. Also recorded from Musselwick Point, Castle Beach, West Dale Bay, Gateholm, Martin's Haven. SKOKHOLM—Peter's Bay, South Haven. SKOMER—Mew Stone, South Haven. March, April, July, August, September.

LEPADOGASTER BIMACULATUS (Bonnaterre) Two-spotted sucker (E 271 ; TJ 107 Plate 40 : BY Plate xxiii)

Musselwick Point, a few ; Gateholm, one, 28.3.48, (RDP).

LEPADOGASTER CANDOLLI Risso (=*L. decandolii*) Connemara sucker (E 271 : TJ 106 Plate 40)

SKOKHOLM—Crab Bay, one, 12.4.48, (BW).

The sun-fish (*Orthagoriscus mola* Day =*Mola mola* (L.)) (TJ 212 Plate 85) occasionally drifts into British waters and Mr. F. Sturley saw one about 1 cwt., off St. Ann's Head about 1938.

Class MAMMALIA (*British Mammals*, L. Harrison Matthews, Collins, London, 1952)

Order CARNIVORA

Sub-Order PINNIPEDIA

Phocidæ

HALICHOERUS GRYPUS (Fabricius) Grey Atlantic seal.

Common in the area, frequently seen on Skomer, Skokholm and Grassholm. Also recorded from Martin's Haven, Whitesands, Monk Haven and Black Rocks (a juvenile). Breeding occurs on Skomer and Skokholm. Seals have been seen to eat fish, squid, conger-eel and puffin.

Order CETACEA

Sub-Order ODONTOCETI

Super-Family DELPHINOIDEA

Phocaenidæ

PHOCAENA PHOCAENA (L) Common porpoise

Dale Roads and off Skokholm, March to July and September.

Delphinidæ

DELPHINUS DELPHIS L. Common dolphin

Schools seen in Dale Roads, 8.1.54 ; 10.2.55, (JHB).

LAGENORHYNCHUS ACUTUS (Gray) White-sided dolphin

Up to 18 individuals in Dale Roads, 18.8.49, 10.2.50, 18.3.50, (JHB).

TURSIOPS TRUNCATUS (Montagu) Bottle-nosed dolphin.

Regular visitors to the Fort area between 8 and 11 a.m. during January and February 1955 and 1956 when courtship and mating seemed to be taking place.

Unidentified species of dolphin have been seen in November and December and, off Skokholm, in July. A whale spouted near South Haven, Skokholm, in May, 1947.

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VOLUME XXIX, PART IV PRICE FIVE SHILLINGS

1957

PROCEEDINGS

OF THE

Bristol Naturalists' Society

EDITED BY SCOTT SIMPSON
ASSISTED BY A COMMITTEE

"Rerum cognoscere causas."—Virgil

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REPORT OF COUNCIL

1957

THE membership of the Society at the end of the year was 584 with 17 Affiliated Societies. There had been an encouraging increase in membership of the Junior Section whose activities were very promising.

At the Annual General Meeting in January the Officers and Members of Council were duly elected with Mr. R. Bassindale as President for a second year of office.

The financial position of the Society had caused Council some concern and this was discussed at the Annual General Meeting when the President announced that a sub-committee had been appointed to consider ways and means of remedy. Later in the year, however, at the November meeting of Council, it was decided that subscriptions should remain unchanged for the present but that the position should be reviewed later if necessary.

The Annual Dinner, at which there was an attendance of 98 members and friends, was held in March in the Senior Common Room of the University by kind permission of its members. The Guest Speaker was Dr. Harrison Matthews, Director of the Zoological Society of London.

Following an appeal in the April issue of the monthly bulletin, Mr. B. Frost volunteered to act as Hon. Publicity Secretary. At the meeting of Council in May his appointment to this office was confirmed. Mr. Frost has a seat on Council and his work in making the activities of the Society more widely known includes a weekly article in the Press.

During the year the deaths of Mrs. E. M. E. Bell, Dr. J. V. Blatchford and Col. W. T. Pares were noted with regret.

C. S. CARLILE, *Hon. Secretary.*

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1957

DURING the year 1957 books and periodicals to the number of 245 were borrowed by 55 different members. A number of volumes were bound and amongst these were some early volumes now rescued from decay. A few new books were added. Gifts of suitable current or older volumes would be welcome additions to some already made. We thank the donors in retrospect and the would-be donors in advance.

J. H. DAVIE, *Hon. Librarian.*

SMITHSONIAN

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	To Members' Subscriptions :—				
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270 12 6	Full Members	1956	2 0 0		
		1957	285 19 6		
		1958	9 0 0		
				293 19 6	
28 5 0	,, ,, of the same household	1957	29 0 0		
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33 3 0	Full Country Members	1957	37 6 6		
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2 19 0	(" Old ") Associates	1956	6 6		
		1957	1 16 6		
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7 0 0	(" New ") Associates	1956	5 0		
		1957	7 2 6		
		1958	2 6		
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12 0 0	Affiliated Societies	1956	1 0 0		
		1957	20 5 0		
		1958	1 0 0		
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19 15 0	Junior Section	1957	25 15 0		
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373 14 6					437 19 0
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2 10 0	General		3 11 6		
14 0	Vaughan's " Avon Gorge "		1 12 6		
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	,, *Proceedings* : Balance on 1955				3 8 6
	,, *Proceedings*, 1956 :—				
6 16 6	Grants, Covers, etc.		187 4 4		
2 10 0	Subscribers		5 15 0		
	Advertisements (3)		7 10 0		
					200 9 4
1 11 0	,, Profit on Dinner				2 13 0
17 8 5	,, Interest on Deposit in Post Office Savings Bank				11 11 7
– – –	,, Field Committee : Surplus over Expenses				10 3 6
405 4 5					671 8 11
608 5 9	,, Balances from last account				355 13 11
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A. H. PEACH, *Hon. Treasurer*,
22 January, 1958.

Cr.

1956 £ s. d.		£ s. d.	£ s. d.
	By Subscriptions :		
1 1 0	Ray Society	1 1 0	
2 16 0	S.W. Naturalists' Union	– – –	
1 1 0	Mammal Society	1 1 0	
			2 2 0
233 1 8	,, *Proceedings* (1956)		436 16 1
19 18 11	,, Stationery	23 5 6	
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	,, Postages, etc. :—		
44 17 8	Hon. Secretary and Assistants	57 6 5	
5 16 7	Hon. Treasurer and Hon. Editor	7 6 7	
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3 15 0	,, Fire Insurance (Library)		3 15 0
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	,, Grants to Sections :—		
– – –	Botanical	15 0 0	
10 0 0	Entomological	10 0 0	
20 0 0	Geological	15 0 0	
15 0 0	Ornithological	15 0 0	
5 0 0	Junior	5 0 0	
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9 19 0	Cash in hands of Field Secretary	20 2 6	
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Audited and found correct,
F. W. EVENS, *Hon. Auditor*,
Bristol, 22 January, 1958.

REPORT OF BOTANICAL SECTION

1957

THE year 1957 ended with the Botanical Section in a very healthy condition and showing considerable growth. The winter meetings have been well attended and the summer outings have been much enjoyed.

At the annual Business Meeting held on January 21, Mr. I. W. Evans was re-elected President and Mr. R. F. Wills Hon. Secretary and Treasurer. Committee members elected were : Mr. F. W. Evens, Dr. A. F. Devonshire, Mrs. G. S. Wakefield, Mr. J. A. Eatough and Mr. A. G. H. A. Sargent.

During the year Dr. Devonshire has continued with the scheme for mapping the British Flora in the Bristol Area and reports the following results at the end of the year : number of species in square 31/56, 391 ; square 31/57, 584 ; square 31/66, 470.

The Wild Plant Table at the Bristol Museum has been much appreciated and we offer our sincere thanks to Dr. F. S. Wallis and Mr. P. Bird of the museum, and to Mrs. G. S. Wakefield and Mr. F. W. Evens and to all our members who have contributed specimens.

On May 11th a whole day Coach trip was taken to Kew Gardens when 41 members were met by Mr. N. Y. Sandwith, who kindly showed us round. On October 14th a members' meeting was held when several members gave short papers on their botanical experiences during the summer, many illustrated by colour slides. This meeting was so successful that it is hoped to make this an annual event.

During the year the following Winter Meetings were held :

Jan. 21 : Annual Business Meeting. Agricultural Problems in the Gambia, by R. A. Webb.
Feb. 18 : Botanising with a Camera by A. G. H. A. Sargent and R. F. Wills.
Mar. 18 : The Family *Geraniaceæ* by I. W. Evans.
Oct. 14 : Members' Evening.
Nov. 11 : Jamaica, a Botanist's Impressions by W. T. Stearn.
Dec. 16 : Plant ecology in the Gordano Valley by A. J. Willis.

The following field excursions took place during the spring and summer under the leadership of those named :—

Apr. 13 : Leigh Woods : Miss D. Shaw and Mrs. G. S. Wakefield.
May 11 : Kew Gardens : R. F. Wills.
May 21 : Downs and Portway : Mrs. G. S. Wakefield.
June 11 : Left bank of River Avon : I. W. Evans.
June 15 : Shipham district : C. H. Cummins.
June 25 : Forest Nurseries, Mendip : T. H. Payne.
July 9 : Mangotsfield to Warmley : I. W. Evans.
July 13 : Ford and Marshfield : A. G. H. A. Sargent.
Aug. 10 : Frog-Pit Lane : I. W. Evans.
Aug. 13 : Abbot's Pool and Failand : F. W. Evens.
Sept. 14 : Clevedon : A. F. Devonshire.
Oct. 12 : Lord's Wood : I. W. Evans.

During the summer months five indoor meetings were held to which members brought specimens for identification and afterwards visits were made to the University greenhouses and the Hiatt Baker Botanical Gardens. It is with deep regret that we have to report the death of Mrs. E. M. Bell, who was for many years Hon. Secretary of the Section, she was also in charge of the Wild Plant Table at the Bristol Museum for quite a long time.

R. F. WILLS, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION

AT the 93rd Annual Business Meeting held on Tuesday, January 8, 1957 Mr. Norman A. Watkins was re-elected President and Mr. C. L. Bell Secretary.

There were five indoor meeting during, the year as follows :—

Feb. 5 : Films—*The Life Story of the Small Tortoiseshell Butterfly, and the Milkweed Butterfly.* Commentary by Norman A. Watkins.
Mar. 5 : Films—*Winter Moths*, commentary by Mr. Blathwayt ; *The Rival World*, commentary by Mr. Bassindale. (Both Films were kindly loaned by Shell.)
Oct. 8 : Films—*The Emperor Moth ; Ants ; Wood Ants.*
Nov. 12 : Talk—The Repair and care of Insects, by R. W. Henderson.
Dec. 10 : Annual Exhibition.

On Saturday, June 1, a Field Meeting was held on the Mendips at the top of Burrington Coombe, and an enjoyable afternoon was spent by the small number present.

CECIL L. BELL, *Hon. Secretary.*

REPORT OF GEOLOGICAL SECTION
1957

At the Annual Business Meeting held in the Geology Department of the University on 19 January the following officers were elected :—President, Mr. F. Stenhouse Ross ; Vice-President, Dr. F. Coles Phillips ; Hon. Secretary, Dr. R. J. G. Savage ; Field Secretary, Mr. V. D. Dennison ; Committee, Professor W. F. Whittard (*ex-officio*), Miss Carlton, Mrs. Perkins, Mrs. Wakefield, Dr. Curtis, Dr. Simpson, Messrs. Fear, Fry, Leese, Turner and Vernon.

The section held an exhibition meeting in January when twelve members exhibited specimens, many of them collected on field excursions with the Society. There was a good attendance and an enthusiastic response from members at this exhibition. In March a programme of geological films attracted a large attendance and topics included in the film programme were coal, copper, erosion and oil prospecting. There were three lecture meetings during the year; in February Prof. E. K. Tratman spoke on " Clare Adventure ", in October Dr. S. Simpson on " New ways of looking at sedimentary rocks ", and in November Col. J. Setchell on " Slate quarrying in Cornwall ".

The field programme comprised seven meetings during the summer months. In April Mr. Fry led a party to Chipping Sodbury to collect minerals and fossils from the Carboniferous and Rhaetic formations. In May members joined the Swindon Geological Society in a tour of the Swindon area under the leadership of Mr. Prismall of Swindon. Mr. Ross led a party in June to the Kellaways Beds near Chippenham and on two evening meetings in July and August members visited the Kings Weston Ridge and Flax Bourton. In September Dr. Curtis led members to Westbury-on-Severn and later in the month the section returned the hospitality of the Swindon society by showing them some of the geological exposures in the Bristol area.

On the suggestion of Dr. Loupekine the section commenced excavations in 1955 on the over-grown quarry in the Inferior Oolite at South Main Road, Dundry. The preliminary preparation of the site was carried out by Mr. T. R. Fry and Mr. M. E. White, and the leaders supervising the excavations were Messrs. Fry, White and Ross, with the assistance of numerous helpers. In September, 1955, the British Association excursion, led by Mr. G. A. Kellaway of H.M. Geological Survey, visited the site and inspected the work in progress : great interest was displayed in the large " gulls " and in the demonstration of the planed-off surfaces at the top of the *sauzei* zone.

Specimens collected from the site were displayed at the Annual Sectional Exhibition in the City Museum in January, 1957. In the autumn of 1957 the Sectional president (Mr. F. S. Ross) undertook the work of deepening excavations to reach lower beds : this work is still in progress.

Members of the section are deeply indebted to the British Association for financial support. Work continues to make this site permanently accessible, the only one in the Bristol area where Oolite can be seen, and further reports will follow.

R. J. G. SAVAGE, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION
1957

'THE WREN
THE WREN
THE KING OF
ALL BIRDS...'

THE Section's roll of members now stands at 190, there having been 13 additions and 2 resignations during the year. The programme of meetings, both indoor and outdoor, was well supported ; but the number of members participating in field-work is still much less than could be desired. However, it is pleasant to record that the number of B.T.O. nest record cards returned has shown a large increase compared with recent years.

At the 33rd Annual General Meeting on January 18th, Mr. G. E. Clothier was elected President, Mr. S. M. Taylor Hon. Secretary, and Miss F. Wareham Assistant Hon. Secretary. Mr. R. F. Wills was elected Hon. Treasurer, a new post intended further to spread the burden of secretarial work. Miss D. Crampton and Mr. P. J. Chadwick were elected to the Committee in place of Miss G. G. Clement and Mr. P. F. Bird, who retired by seniority. The Editorial Committee consisting of Messrs. Chadwick, Davis, King, Poulding and Wright, were re-elected.

The programme of indoor meetings was as follows :

Jan. 17 : Annual General Meeting : Mr. R. H. Poulding—Gull Research in the Severn Estuary.
Feb. 15 : Mr. B. Stonehouse—The King Penguin.
Mar. 6 : Mr. D. F. Owen—Autumn Migration in N.W. Spain.
Mar. 29 : Summer Field-Programme Meeting : short talks, bird-song records and exhibits of skins.
Sept. 27 : Mr. H. G. Alexander—Migration in the Himalayas.
Oct. 23 : Informal and Exhibition Meeting.
Nov. 6 : Dr. W. H. Thorpe, F.R.S.—The Analysis of Bird Song.
Dec. 6 : Mr. I. J. Ferguson-Lees—The Coto Doñana and its Birds.

Attendance at these meetings averaged 78. The Informal and Exhibition Meeting was held at the Royal Hotel, where about 75 members and visitors inspected a wide variety of excellent exhibits prepared by members of the Section, and were able to meet each other in congenial surroundings.

The following field-walks, at which attendances ranged from 25 to 45, were held :

May 4 : Belmont Hill and Failand : Messrs. G. E. Clothier and M. A. Wright.
May 15 : Leigh Woods : Messrs. P. J. Chadwick and H. W. Neal.
May 23 : Little Stoke : Messrs. H. H. Davis and A. C. Leach.
June 4 : Saltford : Mr. B. King.

A very successful all-day excursion to Horner and Chetsford Waters, Exmoor, was held on June 2nd and was attended by 34 members. Among the more interesting observations were raven, reed-bunting and nesting pied flycatchers.

The eighth annual Field-work Report was published in September.

A number of members have asked for assistance in learning something of the more technical aspects of ornithology. Several of the exhibits at the Exhibition Meeting, as well as a large part of the Field-programme meeting, were arranged with this in mind. We were also glad to make use of a course of lectures on 'Bird Behaviour' run by the University, and further courses of a similar nature are being contemplated.

S. M. TAYLOR, *Hon. Secretary.*

REPORT OF JUNIOR SECTION

1957

At the Annual Business Meeting held on January 25 in the Physiology Lecture Theatre, the Members' Committee was elected as follows :—Michael Edgell (Chairman), Anita Drummond (Hon. Secretary), Susan Tapp, Diana Bridges, Nigel Webb and Stephen Moss. The Bristol Waterworks film " Blagdon Trout " was shown.

The following indoor meetings were held :—

Feb. 22 : Miss J. Vinnecombe talked about The Farne Islands, showing a colour film.

Mar. 29 : Three films were shown, " Chameleon of the Sea ", " The Life of ' Quick ' the Squirrel " and " Flight ", depicting seed dispersal.

Sept. 20 : Stephen Moss gave an illustrated talk entitled " Caves and their Inhabitants ".

Oct. 25 : Mr. Tony Soper talked about being a " television naturalist ", and showed several short films.

Nov. 22 : Mr. R. Bassindale on " Marine Biology of Bristol Channel ".

Dec. 13 : Mr. Hugh Boyd on " The Research Work of the Wild Fowl Trust ".

The following Field Meetings took place :—

Jan. 7 : A visit to Ubley Hatchery.

Apr. 13 : Dundry—Leader Mr. F. Stenhouse Ross.

Apr. 24 : A visit to London Natural History Museum, South Kensington.

May 17 : An evening walk in Leigh Woods led by Messrs. P. Chadwick and H. Neal.

May 26 : Steep Holm—Leaders Mr. H. Savory and Mrs. R. Millard.

June 8 : Goblin Coombe—Leader Mr. B. King.

June 22 : Blaise Woods and Kings Weston Down—leader Miss A. Bennett.

July 27 : Kellaway Rocks—leader Mr. F. Stenhouse Ross. An ammonite *Cadoceras sublave* found by Jennifer Dyer was accepted by the Museum.

Aug. 31 : Pill to the mouth of the Avon—leader Mr. H. Neal.

Sept. 8 : Steart—Leaders Mr. and Mrs. R. Wills.

The following meetings took place in the Museum Children's Room (by permission of Dr. Wallis).

June 15 : Short talks on General Field Work.

Nov. 16 : " A Natural History Quiz " arranged by Miss A. Bennett.

The Section Roll shows a substantial increase in strength, it now numbers 111 members. There was an average attendance of 35 at lectures, and field meetings were also well supported. At both lectures and field meetings the section was glad to welcome, in quite good numbers, adult members from other sections.

As far as school programmes would permit, junior members participated in the activities of other sections. This, together with the quality of the season's programme, shows how satisfactorily the Junior Section is integrating in the affairs of the Society. Enthusiasm continues unabated, and there is evident progress in the standard of the work of individual members—as an example, the lecture given by Stephen Moss, a junior member.

The Advisory Committee continued in office. Two new members were elected—Mr. A. G. Clegg and Mrs. R. F. Wills. The resignations of Mr. Ivor Evans and Mr. R. V. Culverwell were accepted. The Officers of this Committee represent the Junior Section on Council.

E. R. MILLARD, *Hon. Secretary Advisory Committee.*
ANITA DRUMMOND, *Hon. Secretary Members' Committee*

ACCOUNT OF THE GENERAL MEETINGS

1957

THE 94th Annual General Meeting was held on Thursday, January 24 when the Officers and Members of Council were duly elected. At this meeting, Mr. Bassindale, the President, in his second year of office, lectured on " A Biologist on the Gold Coast " with special reference to intertidal marine fauna. A specially interesting feature of the lecture was the description of horizontal zones of the sea-shore and the life-cycles of the invertebrate animals conditioned to intermittent exposure to sun and air. The two colour-films of great beauty which were shown with a commentary by the lecturer were most revealing and added considerably to the value of the meeting.

In February, Mr. McMillan, the Parks Superintendent of the City of Bristol, lectured on " Bristol's Parks and Gardens " when members had the opportunity of forming an idea of the development and magnitude of this aspect of civic enterprise.

The new Winter Programme opened with a meeting on October 10, when Professor Harvey of the University of Exeter gave an illustrated talk on " Dartmoor " and dealt with the effect of altitude, weather, soil and drainage on plant and animal life. Professor Harvey's aim in his talk was to sum up the findings of Naturalists on Dartmoor and to indicate general relationships which would lead to a proper conception of its Natural History.

The second Lecture was given by Miss M. Rogers on October 31. Her subject was " A Naturalist looks at North America ". The scope of a single talk had to be limited but members were able to follow a part of her journey from Cape Cod across the Continent to the Great Divide and the Colorado River. By means of numerous colour transparencies a most varied and fascinating account of certain areas was given. These included Niagara Falls, the Moreton Arboretum near Chicago, the climatic zones of the Rockies, the Salt Lake City district and the Colorado Canyon with its visible record of geological change.

On November 14 Mr. P. Carne lectured on " Deer " when he outlined the historical background of these animals from the extinct Irish Elk up to the various species now living in this country under natural conditions. The lecturer gave a general picture of the distribution of deer and much detail concerning their habits and characteristics. Mr. Carne pointed out that research was still needed in the subject.

An interesting talk on " Fish and Aquaria " was given on December 12 by Mr. V. E. Jones, the Keeper of the Aquarium at the Clifton Zoo. A very practical and informative approach to the subject was made which appealed to naturalists of all sections. During his talk, Mr. Jones described the collection of suitable varieties of fish, the construction and maintenance of aquaria with fresh and sea-water both at the Clifton Zoo and in the home.

C. S. CARLILE, *Hon. Secretary.*

GENERAL FIELD MEETINGS

THE successful innovations of the previous year, a meeting in Wales and an all-night meeting were repeated, and for the first time an October meeting was held. As last year only a brief summary of these meetings is given here, but a much fuller account is kept in the records of the Field Section.

April 27 : Leaders—Messrs.T. H. Payne and P. J. Room. Litton reservoir, East Harptree and Minery Woods.

May 18 : Leaders—Mr. and Mrs. D. A. C. Cullen. The gardens at Stourhead and Shearwater lake.

June 1 and 2 : Leaders—Mr. and Mrs. R. F. Wells. An all-night meeting to Dunkery Beacon to hear the dawn chorus. On the way evening bird song was heard at Shapwick Heath.

June 26 : Leaders—Messrs. I. W. Evans and A. F. Devonshire. A cross-Severn meeting to Kenfig Burrows and Llantwit Major.

July 20 : Leader—Mrs. G. S. Wakefield. The Severn shore at Oldbury, Oldbury Church, and Thornbury castle.

Aug. 17 : Leaders—Miss M. Jago and Mrs. R. Millard. St. Catherine's valley and St. Catherine's Court.

Sept. 7 : Leader—Mr. H. G. Hockey. A meeting to the Western Mendips, visiting Callow Hill, Ambleside Water Gardens, Canada Coombe, and Puxton Church.

Oct. 19 : Leader—Mr. G. W. Garlick. Westonbirt Arboretum and Silk Wood.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

BRISTOL BOTANY IN 1957

By Cecil I. and N. Y. Sandwith

IN 1957 an exceptionally mild winter with much rain was followed by one of the earliest seasons we can remember. Some flowers on one of the Horse Chestnuts at Kew were open on the last day of March, and the daffodils here were over long before Easter, which came late in a dry and sunny April. In May, which was variable, a Bee Orchid was in flower by the third week (18th) on the Berrow dunes. The summer was not a very good one, though much better than that of the previous year. There was a fine, hot spell in the last half of June, and many good days in July and August, but September was a very wet month. Much of November was unusually dry and cold, but with less sun here than in the south-east of England.

During the year we lost two well-known botanists. Mrs. E. M. E. Bell was Honorary Secretary of our Botanical Section from 1940 to 1949, and for many years arranged the weekly exhibits in the wild flower case at the City Museum. Her British herbarium includes that of the late H. J. Gibbons, with the exception of many of his specimens of aliens which were selected, by his wish, for our own collection. Commander R. D. Graham, of Stawell, whose adventurous nautical career was described in an obituary in *The Times*, was a good friend to many members of the Wild Flower Society and the Botanical Society of the British Isles, and was himself a valuable member, as the leader of peat moor excursions, of the Botanical Section of the Somerset Archaeological and Natural History Society.

Mr. P. F. Hunt continues to assemble materials for a flora of the rural district of Frome. This year his other work has kept him outside the area, but two friends, Mrs. N. Wycherley and Miss E. Overend, have been most active on his behalf, and Mrs. Wycherley has made large collections of specimens which have been identified at the British Museum Herbarium. These specimens have been listed for the Distribution Maps Scheme, and the authorities at Cambridge have kindly allowed us to abstract records.

Our notes this time include records of a number of naturalized trees and shrubs, as well as the usual list of casual adventives. This is not much to our liking, but is now common practice, and seems inevitable provided that it is kept within reasonable limits.

The names of our principal contributors are abbreviated as follows:

D.M.S., Dr. D. Munro Smith
G.W.G., G. W. Garlick
I.W.E., I. W. Evans
J.P.M.B., J. P. M. Brenan
N.W., Mrs. N. Wycherley.
P.J.M.N., P.J.M. Nethercott
R.G.B.R., Commander R. G. B. Roe

Helleborus viridis L. Tower House Wood, Wraxall, **S.**, 1921, etc., *C.I.S.* and *N.Y.S.* Laneside, Nettlebridge, **S.**, *F. M. Pilkington.* Vallis Vale, **S.**, *N.W.*

Aconitum anglicum Stapf. By a stream bordering a meadow at Kilmersdon, **S.**, *R.G.B.R.* For the original account of this species see the *Botanical Magazine*, t. 9088 (1926). Our colonies, at any rate those near Frome, Mells and Edford, which have been considered native, are certainly to be referred here. The status and rank of this " taxon ", however, cannot be regarded as in any way settled.

Mahonia Aquifolium (Pursh) Nutt. Woodland above Bridge Valley Road, Clifton, **G.**, *G.W.G.*

Nasturtium microphyllum (Boenn.) Reichb. Marsh in valley between St. Catherine and Ashwicke Park Hall, **G.**, *J.P.M.B.*

Cardamine pratensis L. The *flore pleno* form was found near Cromhall, **G.**, by *Miss M. Harris.*

Sinapis alba L. em. Alef. Cornfield and lane, Cameley, **S.**, *R.G.B.R.*

Saponaria officinalis L. Roadside, Kelston, **S.**, *Mrs. M. H. Simpson.*

Stellaria Holostea L. var. *apetala* Rostr. ex Asch. et Gr. Roadside bank below Damery Bridge, **G.**, *G.W.G.*

S. palustris Retz. In rough marshy ground known as " The Meads", near Duckhole, north of Thornbury, **G.**, 1953 and subsequently, *Dr. D. C. Prowse.* A very interesting addition to the Glos. side of the area and to District 5 of *Fl. Glos.*

Minuartia tenuifolia (L.) Hiern. On railway sidings at Hapsford, Vallis Vale, **S.**, *E. Milne-Redhead.* Embankment of disused quarry railway, Chilcompton, **S.**, *R.G.B.R.*

Sagina nodosa L. Side of track in an open part of Westridge Wood, Wotton-under-Edge, **G.**, *D.M.S.*

Montia fontana L. ssp. *chondrosperma* (Fenzl) Walters. Bury Hill, Moorend, **G.**, *D.M.S.*, verified by *Dr. S. M. Walters.*

M. fontana L. ssp. *intermedia* (Beeby) Walters. Marshy spot on Rodway Hill, Mangotsfield, **G.**, *G.W.G.* and *N.Y.S.*, verified by *Dr. Walters.*

Geranium phaeum L. Laverton Common, **S.**, *N.W.*

G. Robertianum L. The form with white flowers occurs in Canynge Road, Clifton, **G.**, *C.I.S.* ; and in a lane at Stoke Bishop, **G.**, *Mrs. W. Cummins.*

Impatiens glandulifera Royle. Between Frome and Great Elm, **S.**, *N.W.* and *Miss E. Overend.*

Acer platanoides L. A small tree of the Norway Maple is established by the tow-path below Leigh Woods, **S.**, *I.W.E.* This species is commonly planted in our district.

Trifolium squamosum L. In small quantity on waste ground at Hambrook, **G.**, *D.M.S.* A strange habitat for this maritime plant.

Lathyrus sylvestris L. Hedge below Limeridge Wood, Tickenham, **S.**, 1921, *C.I.S.* and *N.Y.S.*

Prunus Mahaleb L. A small tree is established on the slope of the Downs opposite the Zoological Gardens, Clifton, **G.**, *N.Y.S.* It is the forma *pendula* Dippel, which is well-known in gardens. This species, the " Bois de Sainte Lucie " of France, is not found in the British Plant List, but a tree of the typical form was found naturalized in a wood between Tregony and Tresillian, E. Cornwall, by us in April, 1936 (specimen in Herb. Kew).

Potentilla erecta (L.) Hampe × *reptans* L. Coalpit Heath viaduct, **G.**, *D.M.S.*

Agrimonia Eupatoria L. A curious sport was found above Wotton-under-Edge, **G.**, by *Mrs. W. Cummins.* In this plant the flowers, which were borne on elongated and steeply ascending pedicels, were more or less " double ", with 9-10 petals and very few stamens, some of the latter being petaloid. A somewhat similar sport of Agrimony was collected a few miles away, in Woodchester Park, in June, 1941, by *Mr. H. K. Airy Shaw*, see his specimen in the Kew Herbarium.

Sorbus latifolia (Lam.) Pers. *P.J.M.N.* has noted a well-grown tree on each side of the Avon Gorge, **G.** and **S.**, which *Dr. E. F. Warburg* has identified as " *latifolia* of gardens."

Crataegus oxyacanthoides Thuill. Alderley, **G.**, *E. P. Bury.*

Cotoneaster horizontalis Decaisne. One small shrub established on Cheddar Cliffs, **S.**, *P.J.M.N.*

C. Simonsii Baker. In two spots in Leigh Woods, **S.**, *P.J.M.N.*, and compare Mr. White's comment (*Flora*, p. 303) on Mr. F. Samson's bush recorded from Nightingale Valley as *C. microphylla* Wallich.

Tellima grandiflora (Pursh) Dougl. ex Lindl. Under Beech trees in private woods near Henleaze Road, **G.**, *Miss A. Furber* ; and on a bank at Upton Cheyney, **G.**, *Miss Britton.* This North American herb (*Saxifragaceae*), with greenish, pectinately fringed petals, is frequently found planted or semi-wild.

Epilobium hirsutum L. × *parviflorum* Schreb. Commonmead Lane, Old Sodbury, **G.**, *G.W.G.*, passed by *G. M. Ash.*

E. adnatum Griseb. × *parviflorum* Schreb. Pond, Mead Ridings, Chipping Sodbury, **G.**, *G.W.G.*, also passed by *Mr. Ash.*

Petroselinum segetum (L.) Koch. Sheperdine, **G.**, *D.M.S.*

Symphoricarpos rivularis Suksd. Established in Leigh Woods, **S.**, *P.J.M.N.*

Valerianella carinata Lois. On limestone rocks, Wadbury Valley, between Mells and Great Elm, **S.**, *N.W.*

Filago minima (Sm.) Pers. Gravelly ground, Bury Hill, Moorend, **G.**, *D.M.S.*

Petasites fragrans (Vill.) Presl. Field at Nettlebridge, **S.**, *F. M. Pilkington.*

Doronicum Pardalianches L. Wadbury Valley, **S.**, one clump, *N.W.*

Senecio squalidus L. Kilmersdon and Radstock, **S.**, *R.G.B.R.*

Cirsium eriophorum (L.) Scop. Limestone grassland in valley between St. Catherine and Ashwicke Park Hall, **G.**, *J.P.M.B.* Waste ground by the towpath near Ashton Bridge, Bristol, **S.**, *G.W.G.*

Hieracium glevense (Pugsl.) Sell et C. West. Whitewell Bottom, Kilcot, **G.**, *G.W.G.*, confirmed by *Sell* and *West.*

H. umbellatum L. Michael Wood, Damery, **G.**, *G.W.G.*, confirmed by *Sell* and *West.*

Vaccinium Oxycoccos L. Last June we were pleased to find that the patch on Blackdown, **S.**, had survived fires and war-time activities on the summit of Mendip. But we could not see *Andromeda.*

Symphytum × *upplandicum* Nym. Symonds Hall Hill, Wotton-under-Edge, **G.**, *G.W.G.* Roadside south of Ashwicke Hall, Marshfield, **G.**, *G.W.G.* Specimens from both localities determined by *A. E. Wade.*

Atropa Belladonna L. One small plant on Durdham Down, opposite Pembroke Road, Clifton, **G.**, *J. Newton*, comm. *G.W.G.* One plant in Court Lane, Bitton, **G.**, *Mrs. M. H. Simpson.*

Hyoscyamus niger L. Ploughed field at Nibley, near Yate, **G.**, *G.W.G.* It has also appeared on the blitzed area near Wine Street, Bristol, **G.**, *I.W.E.*

Linaria repens (L.) Mill. By disused railway track, Camerton, **S.**, *R.G.B.R.*

L. × *sepium* Allm. (*L. repens* × *vulgaris*). Railway banks, Ashley Hill, **G.**, *I.W.E.*

L. purpurea (L.) Mill. Old quarries, Whatley Bottom, **S.**, *N.W.*

Veronica filiformis Sm. In *Proc. Bot. Soc. Brit. Is.*, vol. 2, pp. 197-217 (1957), *Messrs. E. B. Bangerter* and *D. H. Kent* list all the known British records of this rapidly spreading garden escape. There are several records from both sides of our area which have not appeared in these annual notes, and to these we may add : Huntingford Mill, Charfield, **G.**, *G.W.G.*, and Wadbury Valley, Frome, **S.**, *N.W.*

Orobanche maritima Pugsl. On *Daucus Carota* L., on a slope at the root of Brean Down, **S.**, south side, *I.W.E.*, confirmed by *R. A. Graham.* This is a microspecies with very obscure characters, doubtfully distinguishable from *O. minor.*

Mentha gentilis L. var. *gracilis* (Sole) Fraser. Waste ground at Fishponds ; and at Rodford, Westerleigh, **G.**, *D.M.S.*, det. *R. A. Graham.*

Thymus pulegioides L. Compton Dando, **S.**, 1956, *I.W.E.*

Stachys sylvatica L. and *S. palustris* L. There are no published local records of the white-flowered forms of these species. We have specimens of both in our herbarium : of *S. sylvatica*, from a hedge at Long Ashton, **S.**, in 1919 ; and of *S. palustris*, from the peat moor near Ashcott Station, **S.**, in 1915. White *S. sylvatica* is surely a very uncommon albino.

Polygonum mite Schrank. Drove on Glastonbury Heath, **S.**, *A.D.* and *O.M. Hallam.*

***Euphorbia** virgata* Waldst. et Kit. Railway embankment, Winterbourne, **G.**, *D.M.S.*

Mercurialis annua L. Garden weed, Glastonbury, **S.**, *F. M. Day.*

Juglans regia L. A young tree on Cheddar Cliffs, **S.**, *P.J.M.N.*

Betula pubescens Ehrh. Spoil-heap at Greyfield, Clutton, **S.**, *R.G.B.R.*

Populus trichocarpa Torr. et Gray ex Hook. The trees in Alderley Wood and Dyrham Wood, **G.**, previously reported as *P. balsamifera* L. in " Bristol Botany " in 1953 and 1954, must be referred to this species, which has more sharply angled twigs. Material from Dyrham Wood was submitted to *Mr. P. G. Beak*, of the Commonwealth Forestry Bureau, Oxford, who tells us that, in his experience, British planted trees of *P. trichocarpa*, apart from those of special collections, can be distinguished from *P. balsamifera* by the male catkins.

Salix repens L., ssp. *repens.* Michael Wood, Damery, **G.**, *G.W.G.*

Ceratophyllum demersum L. Oldford, north of Frome, **S.**, *N.W.*

Orchis mascula L. The form with pure white flowers was found in the Lower Woods, east of Wickwar, **G.**, by *E. P. Bury.*

O. ericetorum (Linton) Marshall. Between Marshfield and Cold Ashton, **G.**, *D.M.S.* Lower slopes of Knowle Hill, south of Chew Magna, **S.**, *Dr. A. F. Devonshire.* Plentiful, as surely noted by many observers, in the bogs of Blackdown on Mendip, **S.** There is also a specimen at Kew from near Cheddar Head Farm, collected in 1934 by *Dr. J. Hutchinson* and *Messrs. F. Ballard* and *C. E. Hubbard.*

Epipactis leptochila (Godfery) Godfery. Cheddar Gorge, **S.**, on the north side, in Ash and *Sorbus* scrub, two plants growing with *E. Helleborine*, *Dr. J. T. H. Knight*, confirmed by *V. S. Sumnerhayes.* This is the first certain record from the Somerset side of the district, cf. " Bristol Botany in 1948."

Neottia nidus-avis L. Hardington Copse, north of Mells, **S.**, *NW.*

Convallaria majalis L. Hardington Copse, **S.**, *N.W.*

Juncus tenuis Willd. Michael Wood, Damery, **G.**, *D.M.S.*

Sparganium neglectum Beeby. Streams and ditches by the R. Frome at Oldford, **S.**, *C.I.S.* and *N.Y.S.*

Acorus Calamus L. A strong colony by the Avon near Ferry Lane, below Keynsham, **S.**, *I.W.E.* ; and much lower down-stream, within the City, at the west end of the Feeder, **G.**, *Dr. A. F. Devonshire.* Chantry, west of Frome, **S.**, *Miss E. Overend.*

Potamogeton Berchtoldii Fieb. Stream by the R. Frome at Oldford, **S.**, *C.I.S.* and *N.Y.S.*, confirmed by *Mr. J. E. Dandy.*

Scirpus maritimus L. var. *macrostachys* Willd. Dyke in the flats below Portbury, **S.**, 1923 and subsequently, *C.I.S.* and *N.Y.S.* This form, with conspicuously long spikes, was recorded, *lapsu calami*, as var. *monostachys* Meyer, in *B.E.C.* (1930 Rep.), vol. ix, p. 375.

S. sylvaticus L. Ditch near Lyde Green, **G.**, *D.M.S.*

Carex strigosa Huds. By wooded stream in valley between St. Catherine and Ashwicke Park Hall, **G.**, *J.P.M.B.*

C. extensa Good. Muddy salt-marsh, Aust, **G.**, 1955, *Miss A. R. Gibbs.* An excellent second locality for the Glos. side of the area.

C. pallescens L. Leap Bridge, Downend, **G.**, *D.M.S.*, det. *G.W.G.*

C. paniculata L. Marsh by stream in valley between St. Catherine and Ashwicke Park Hall, **G.**, *J.P.M.B.* New to the Glos. side of the area and to District 5 of *Fl. Glos.*

C. disticha Huds. Swampy ground, Cromhall, **G.**, *D.M.S.*

Calamagrostis Epigeios (L.) Roth. Limeridge Wood, Tickenham, **S.**, 1923, *C.I.S.* and *N.Y.S.*

Deschampsia cæspitosa (L.) Beauv. var. *parviflora* (Thuill.) Coss. et Germ. This variety, with narrow leaves and small spikelets, is probably common, especially in woods on stiff soils. There seem to be no published records, but we have it from woodland on Combe Down, Bath, **S.**, 1923, and from Horridge Wood, Nettlebridge, **S.**, last August.

Glyceria declinata Bréb. Marshy spot in the valley between Edford and Nettlebridge, **S.**, *C.I.S.* and *N.Y.S.*

G. × *pedicellata* Towns. By stream in valley between St. Catherine and Ashwicke Park Hall, **G.**, *J.P.M.B.*, det. *C. E. Hubbard.*

Bromus lepidus Holmb. Edge of wheat-field between Nunney and Collie Corner, **S.**, *E. Milne-Redhead.*

Dryopteris Borreri Newm. Valley beteen St. Catherine and Ashwicke Park Hall, **G.**, *J.P.M.B.*, det. *P. Taylor.* Dyrham Wood and Westridge Wood, Wotton-under-Edge, **G.**, *G.W.G.* On rocks in Nightingale Valley, Leigh Woods ; and in Cheddar Wood, **S.**, *G.W.G.* Mr. Garlick's specimens, all collected in localities with oolitic or carboniferous limestone substrata, were passed by *Mr. A. H. G. Alston.*

D. spinulosa (Müll.) Watt. Michael Wood, Damery, **G.** *D.M.S.*, det. *A.H.G. Alston.*

Polystichum setiferum (Forsk.) Woynar. Lane along the top of Aust Cliffs, **G.**, *G.W.G.*

Chara vulgaris L. var. *refracta* Kütz. Rhine on Weston-in-Gordano moor, 1914 ; Walton-in-Gordano, 1935 ; and on Mark Moor, 1915, **S.**, *C.I.S.*, all determined by *Mr. G. O. Allen.* A small, neat plant with relatively short, often refracted branchlets with short terminal segments, not previously reported from the area.

ALIENS. *Lunaria annua* L. A specimen of the white-flowered form (var. *alba* Hort.) of " Honesty " was sent from the edge of a wood on Lansdown, **S.**, by *B. L. Carpenter.*

Spergula arvensis L. var. *sativa* (Boenn.) Mert. et Koch. Avonmouth Dock, **G.**, 1930 and 1957, *C.I.S.* and *N.Y.S.*

Althæa hirsuta L. Quarry edge, Chipping Sodbury, **G.**, *G.W.G.*

Trifolium echinatum Bieb. Wapping Wharf, Bristol Harbour, **G.**, 1930, *I.W.E.*

Vicia lutea L. Wapping Wharf, **G.**, 1941, *I.W.E.*

Lathyrus Cicera L. Refuse-tip, Hanham, **G.**, 1948–1949, *I.W.E.* Rubbish-tip, St. Anne's, **S.**, 1913, *I.W.E.*, incorrectly recorded as *L. sativus* in the *Adventive Flora of the Port of Bristol.*

Phuopsis stylosa (Trin.) Benth. et Hook. fil. Waste ground at the lime-kilns near Corston, **S.**, *Miss Joan Day*, who writes that the quarry here was used for dumping debris after the Bath blitz. *P. stylosa* is a well-known rock-garden plant, native of N.W. Persia and the Caucasus, see N. Polunin in *B.E.C.* 1939–1940 Rep., vol. xii, pp. 356-8 (1942). It has been placed in both *Asperula* and *Crucianella.*

Madia sativa Mol. ssp. *capitata* (Nutt.) Piper. Ashton Gate tip, **S.**, 1948, *I.W.E.*

Galinsoga ciliata (Raf.) Blake. Wayside, Coalpit Heath, **G.**, *D.M.S.*

Tagetes minuta L. Avonmouth Dock, **G.**, *C.I.S.* and *N.Y.S.*

Anthemis tinctoria L. Quarry, Tytherington, **G.**, *D.M.S.*

Omphalodes verna Moench, *Pulmonaria officinalis* L. and *Pentaglottis sempervirens* (L.) Tausch were gathered on waste ground at Tedbury Common, near Great Elm, **S.**, by *N.W.*

Cuscuta campestris Yuncker. On China Aster (*Callistephus chinensis*) in a garden off Horfield Avenue, Bristol, **G.**, *W. Solley*, comm. *P. F. Bird.* A native of U.S.A., now frequently found in this country, introduced with garden seed. Previous collections of alien *Cuscutæ* at Bristol, recorded in the *Adventive Flora* under the names *C. suaveolens* (Baptist Mills, 1927) and *C. Tinei* ssp. *Cesatiana* (Kingswood, 1932) have been referred to *C. campestris* by *Mr. B. Verdcourt*, who specialises in the genus. We suggest that other recorders of *C. Cesatiana* should re-examine their specimens (cf. *Proc. B.S.B.I.*, vol. 1, p. 39, 1954), using Prof. Yuncker's revision of the genus. The pale orange-coloured stems of *C. campestris* are very striking when fresh.

Datura Stramonium L. " Thorn Apple " is appearing in many places. The *Chipping Sodbury Gazette* for Sept. 7th and 21st reported Gloucestershire records from Alveston, Wotton-under-Edge and Halmore, near Berkeley. It occurs at Avonmouth, **G.**, both in the Dock and in an allotment (*H. C. Rowley*). Garden at Keynsham, **S.**, *R. F. Wills.* Garden at Brent Knoll, **S.**, *H. Solomon.*

D. Stramonium L. var. *Tatula* (L.) Torrey, the variety with deep purple stems and leaf-nerves, and bluish lilac flowers, was found by us at Avonmouth Dock, **G.**, and is new to the *Adventive Flora.* It also appeared in a garden at Siston, **G.**, *A. S. Jones*, comm. *P. F. Bird.*

D. ferox L. Avonmouth Dock, **G.**, *C.I.S.* and *N.Y.S.* New to the *Adventive Flora.* This is a very distinct species, with greyish-green leaves, small yellowish flowers, and fruit with fewer and very stout spines. It is a native of the Far East.

Nicandra physaloides Gaertn. Several plants on waste ground at Saltford, **S.**, *Miss Norma Longman.* This handsome species, native of Peru, has recently acquired a rather dubious reputation under the name " Shoo-fly Plant ", and seeds are offered for sale in at least one catalogue, the author of which does not guarantee the plant's efficacy. We may expect further records.

Phlomis viscosa Poir., a native of Asia Minor, has been well established for a number of years on a hedgebank near Mells, **S.**, *N.W.*, det. *R. D. Meikle* at Kew.

Amaranthus caudatus L. Previously unreported, either in the *Adventive Flora* or these annual notes, but was collected on several occasions at the Ashton Gate tip, **S.**, 1935–1940, by *I.W.E.*, *J.P.M.B.* and *C.I.S.*; and at Fishponds, **G.**, 1936, by *C.I.S.*

A. retroflexus L. Tip, Widdin Hill, Horton, **G.**, *G.W.G.*

Allium Moly L. This golden-flowered species, native of Southern Europe and well-known in gardens, was reported from waste ground at Corston, **S.**, by *Miss Joan Day.*

A. Schoenoprasum L. Side of a narrow lane leading from Burnt House, Odd Down, to Combe Hay, **S.**, *Miss S. F. Lloyd.* A long way from habitations, but " Chives " might well have grown in the garden of a cottage long since demolished.

Arum italicum Mill. Grassy roadside outside a property in Leigh Woods, **S.**, *T. Titchen* and *I.W.E.* The usual garden form of the species, with yellow-veined leaves.

Panicum miliaceum L. and *Setaria italica* (L.) Beauv. Tip, Widdin Hill, Horton, the former also in gardens at Yate, **G.**, *G.W.G.*

Eleusine Gaertn. Our two gatherings of this genus at Avonmouth, **G.**, reported in the *Adventive Flora* as *E. indica* Gaertn., have been examined by *Mr. C. E. Hubbard* who refers the 1926 collection to the new species, *E. africana* Kennedy-O'Byrne, and the 1930 specimens to *E. coracana* (L.) Gaertn. *Mr. P. Taylor* tells us that in tropical East Africa the former is used for basket-making, the latter as a cereal and in the manufacture of beer.

Bromus madritensis L. On the railway lines at Sandford quarry, **S.**, *I.W.E.* and *G.W.G.*

We congratulate Mr. J. D. Grose on his excellent " Flora of Wiltshire ", which contains such interesting innovations as distribution maps, properly defined frequency terms, and statistical analyses of the habitats of closely allied species, while maintaining most of the attractive features of the traditional county flora. This book, of course, is of particular importance for Bristol botanists.

BRISTOL BIRD REPORT
1957

COMPILED BY THE EDITORIAL COMMITTEE OF THE
B.N.S. ORNITHOLOGICAL SECTION

B. K. BROOKE H. H. DAVIS
P. J. CHADWICK R. H. POULDING
M. A. WRIGHT

THIS report, the twenty-second of the series, contains records for 1957 and is the outcome of observations by thirty-eight members and various non-members. Only the more important events have been included, but it may again be pointed out that all unpublished material will be retained for future reference.

Interesting records from the Severn Estuary are of three Lesser White-fronts at the New Grounds, January-March, and at the same place, fifteen Little Stints in February and at least 400 Pintail in late December. Spotted Redshank, by no means common on the river, were reported from the New Grounds, July-August, and Severn Beach in September, and Black-tailed Godwits reached the unusually high figures of 40 at the New Grounds and 75 at Sheperdine—both counts in September. Following severe gales in January-February a " wreck " of Kittiwakes affected many parts of the Estuary (and some areas inland)—more than 100 birds being recovered, while other coastal recoveries included Razorbills at Sand Bay, and Clevedon in March and August respectively ; a Manx Shearwater at Sand Bay in April ; a Fulmar at Clevedon in September, and a Glaucous Gull at the same place in December. Leach's Petrels were seen at Purton and Severn Beach in September, and in the same month a juvenile Sabine's Gull was identified at Weston-super-Mare.

Among wildfowl observations from the reservoirs are those of Bewick's Swans at Blagdon in January and December, and unusual numbers of Gadwall at Chew Valley and a Long-tailed Duck at Cheddar from October to early December. Wintering Spotted Redshank were reported from Blagdon and Chew Valley ; a Curlew Sandpiper and one or more Wood Sandpipers were at Chew Valley, August-September, and a Grey Phalarope was seen at the same place in November. A Hen Harrier visited Chew Valley in January ; an exceptionally large passage of Black Terns was noted at Chew Valley and Cheddar in the third week of

September ; and Little Gulls occurred at Cheddar in August and Chew Valley in December.

Other important records include those of a Kite at Tockington in March ; and a very large count of Golden Plover at Marksbury in December ; while among passerine observations mention may be made of Crossbills at Ubley, January-February, and Abbots Leigh in April, and Snow Buntings at Cheddar reservoir and in the Weston-super-Mare area in November-December. Waxings were reported from several localities during the last six weeks of the year.

Breeding records of special interest are of the rearing of young by at least twenty-three pairs of Tufted Duck at Chew Valley, and the successful nesting of Shelduck at the same reservoir ; the rearing of young by Kestrels in the tower of St. Stephens in the City ; and the successful nesting of a pair of Herring Gulls at Aust Cliff.

Unless otherwise stated the records below refer only to 1957, and for the most part are the result of contributions by the following *members* : R. Angles, A. E. Billett, H. J. Boyd, B. K. Brooke, G. C. Buxton, Mrs. S. I. Buxton, P. J. Chadwick, D. R. J. Chaffe, S. E. Chapman, Miss G. G. Clement, G. E. Clothier, H. H. Davis, Miss P. Farmer, Miss C. D. G. Graham, D. R. Hamblett, W. A. Holmes, B. King, A. C. Leach, T. D. H. Merrie, H. W. Neal, P. J. M. Nethercott, Mrs. B. C. Palmer, Miss E. M. Palmer, T. H. Payne, R. A. Pitman, R. H. Poulding, J. A. Pryce, J. Reynolds, W. L. Roseveare, P. Scott, T. B. Silcocks, G. Sweet, Miss S. Sweet, T. P. Walsh, N. Webb, Mrs. D. A. Wills, R. F. Wills and M. A. Wright. *Non-member contributors* are : H. G. Alexander, J. V. Beer, E. G. Brain, Dr. N. J. Brown, R. J. Buxton, Miss M. Collins, M. Davy, A. G. Dixon, Miss M. Flower, A. C. Gambier, B. E. Gambier, Miss P. Hitchen, D. A. Holmes, S. T. Johnstone, J. Kenny, R. J. Lewis, C. S. Louch, J. A. McGeoch, S. G. Madge, P. J. Olney, M. W. Pickering, R. Pritty, A. Thomas, P. Tibbs, J. A. F. Wilkins, Rev. J. S. Wright and G. H. E. Young. Observations are followed by the appropriate initials throughout. The abbreviations Res. Stn. and Jnr. Sect. refer, respectively, to the Steep Holm Trust Gull Research Station and the B.N.S. Junior Section.

The area covered is that part of Gloucestershire (**G.**) lying east of the Severn and south of a line from the New Grounds to the county boundary at Tetbury, and Somerset (**S.**) north of the R. Axe and a line from Wells to the county boundary near Frome. For the purpose of this report the area extends westward into the Channel and Estuary to include the promontory of Brean Down and the islands of Steep Holm and the Denny (cf. Sketch Map, *Proc. B.N.S.*, 1947, p. 225).

GREAT NORTHERN DIVER *Gavia immer*

S. Single birds, Blagdon res., various dates, Jan. 3-Mar. 31 (S.I.B., Jnr. Sect. *et al.*) ; Cheddar res., Feb. 24-Apr. 14 (B.K.B., B.K., J.A.McG.) ; and Chew Valley res., Nov. 17 (B.K.).

RED-THROATED DIVER *Gavia stellata*

S. One, Cheddar res., Feb. 19 (W.L.R.) and first-year bird, same place, Nov. 23-Dec. 22 (B.K., J.A.McG.).

GREAT CRESTED GREBE *Podiceps cristatus*

S. Highest counts, Cheddar res. : twenty, Jan. 20 (J.A.McG.), and 22, Dec. 1 (B.K.). Freshly dead, first-winter female with severe head injuries, same place, Nov. 24, was probably killed by Great Black-backed Gull in vicinity (J.A.McG.). Thirty-four ads., Chew Valley res., July 21 ; later, Aug. 18, ads. with five separate broods seen (B.K.). Four pairs with young, Blagdon res., Aug. 17 (P.J.C.). Single bird off Sand Point, Nov. 16 (T.B.S.).

SLAVONIAN GREBE *Podiceps auritus*

S. One, Cheddar res., several dates, Oct. 13 to end of Dec. (J.A.McG., G.S. *et al.*).

BLACK-NECKED GREBE *Podiceps nigricollis*

S. First-winter bird, Cheddar res., Sept. 29-Oct. 13 (B.K., J.A.McG., G.S.).

LITTLE GREBE *Podiceps ruficollis*

S. At least nine separate broods with ads., Chew Valley res., Aug. 18 (B.K.) ; single pair with three young, Blagdon res., Aug. 24, and an ad. with three young, Chew Magna res., Aug. 5 (P.J.C.). Pair with two young, Newton Park, Bath, June 6 (M.C., B.K.). Adult in Axe Estuary, Uphill, Aug. 21 (R.A.).

LEACH'S PETREL *Oceanodroma leucorrhoa*

G. One in flight over Estuary, Purton, Sept. 14 (D.R.H., T.P.W.) and another on 15th flying along tide-line, Severn Beach (H.H.D.).

MANX SHEARWATER *Procellaria puffinus*

S. One with oil on breast and flanks, dead on shore, Sand Bay, Apr. 7 (R.A.).

FULMAR *Fulmarus glacialis*

S. Oiled bird found dead, Clevedon, Sept. 14 (D.A.W.).

GANNET *Sula bassana*

S. Single ads. found dead, Cheddar res., Aug. 26 (N.W.), and Sand Bay, Dec. 24 (M.A.W.).

CORMORANT *Phalacrocorax carbo*

S. Numerous reservoir records include: five, Chew Valley, Jan. 6 (B.K.); ten, Cheddar, Mar. 3 (J.A.McG.), Dec. 1 (B.K.); single birds, Barrow Gurney, Nov. 22, 24 (G.E.C., W.A.H.); and two, Blagdon, Dec. 26 (P.J.C.).

SHAG *Phalacrocorax aristotelis*

G. Juvenile found dead, Berkeley, Aug. 16, had been ringed in June by the Lundy Bird Observatory (Wildfowl Trust).
S. Single immatures, Cheddar res., Mar. 17 (J.A.McG.), Apr. 13 (B.K., N.W.) and Sept. 22, 29 (J.A.McG.).

HERON *Ardea cinerea*

S. Total of 55 occupied nests reported: 32, Brockley Combe, May 4 (B.K., N.W.); 22, Uphill Grange, May 8 (W.L.R.) and one in larch, Newton Park, Newton St. Loe, Apr. 15 (B.K.). Again no information from Warleigh Wood, nr. Bath and Orchardleigh, nr. Frome.

MALLARD *Anas platyrhynchos*

G. Highest counts at the New Grounds (Estuary and W.T. enclosures): 530, Jan. 24; 700, Sept. 25; 590, Oct. 15; and 1,100, Dec. 22 (H.J.B.). 1,200 on decoy pool, same place, in early morning of Dec. 24 (P.S.). Record total of 1,552 ringed in the decoy in period Aug.-Dec. (H.J.B.). Combined count of 105, Eastville Park and Duchess' Pond, Stapleton, Jan. 27 (J.A.P.).
S. Counts of 100-180 at frequent intervals throughout year from coastal areas—Yeo Estuary, Sand Bay and Weston Bay (R.A., W.L.R., T.B.S.). Peak totals, Blagdon res., reported in period July-Sept., with numbers varying from 325 to 610 (P.J.C., B.K., M.A.W. *et al.*), while max. returns from Chew Valley are of 585, May 29 600, Aug. 4 and 580 on 25th (G.C.B., S.I.B., B.K. *et al.*). Highest totals, Cheddar res.: 127, Aug. 18, and 180, Dec. 8 (J.A.McG.) and Barrow Gurney resrs.: 174, Dec. 27 (G.E.C.) and 250 on 31st (A.C.L.). Breeding data from Chew Valley suggests

that a minimum of 40 females brought young to the water and that at least 245 ducklings were reared to flying stage. Only six broods seen, Blagdon, where breeding success apparently much lower (H.J.B., B.K.).

TEAL *Anas crecca*

S. Noteworthy coastal counts are of 160, Yeo Estuary, Jan. 12 ; 212, same place, Dec. 28 (T.B.S.) ; and 100, Sand Bay, Nov. 17 (R.A.). The only large counts from the reservoirs are of 550, Blagdon, Jan. 23 (G.C.B., S.I.B.) and Chew Valley : 535, Mar. 2 (B.K.) and 460, Nov. 24 (G.C.B., S.I.B.). An adult ringed, Naardermeer, Holland, 16/10/56, recovered, Blagdon res., 31/1/57 (R.H.P.).

GARGANEY *Anas querquedula*

G. Single female in W.T. enclosures, New Grounds, early Mar.-early Apr., and a male, Apr. 4-8 (S.T.J., P.S.). A female in same enclosures for most of Aug. (S.T.J.). Male on Estuary, New Grounds, July 15 (P.J.O.).

S. Two or three, Chew Valley res., various dates, mid.-Apr. to third week of July (E.G.B., P.J.C., R.J.L. *et al.*). Four pairs, same reservoir, Apr. 20 (B.K.). A female, Chew Valley, as late as Oct. 27—seen by B.K., who has supplied full details.

GADWALL *Anas strepera*

S. Reported from the reservoirs, Blagdon and Chew Valley, at all seasons and in numbers exceeding those of any previous year. Records from Blagdon are of two, Jan. 13 (R.J.L.) and Nov. 11 (G.G.C.); nine, Dec. 12 (G.C.B., S.I.B.) and six on 26th (P.J.C.). Chew Valley returns are of one, Jan. 13 (B.K., R.J.L.) ; up to four on various occasions, Apr.—June (E.G.B., P.T., N.W. *et al.*) ; eight, Aug. 25 (P.J.C., M.A.W.) ; 12, Sept. 22 (H.H.D., M.A.W.) ; 17, Oct. 22 and 27 (P.J.C., B.K.) ; 16, Nov. 17, and 29, Dec. 6 (B.K.).

WIGEON *Anas penelope*

G. New Grounds : max. figures from the Estuary of 1,200, Jan. 24 ; 1,060, Feb. 1 (H.J.B.) ; 1,200, Nov. 16 (B.K.) ; and 1,600, Dec. 22 (H.J.B.). Count of 203 on the river, Oldbury-on-Severn, Dec. 1 (T.D.H.M.).

S. Many fewer, Blagdon res., than in recent years ; highest count, 200, Feb. 27 (G.C.B., S.I.B.). Large numbers, Chew

Valley, Jan.-early Mar. and Dec. (but no repetition of the exceptional totals in 1956), with max. counts of 1,200, Jan. 6 (B.K.); 1,470, Jan. 27 (G.C.B., S.I.B.); 1,250, Mar. 3 (B.K.); 1,072, Dec. 27 (P.J.C., M.A.W.) and 940 on 29th (B.K.). Summer records from Chew Valley are of a pair on various dates, Apr.-June (P.J.C., B.K., M.A.W.); two males, June 7 and a female, July 14 (B.K.). Figures from Cheddar res. again low, with max. of 30, Dec. 22 (J.A.McG.).

PINTAIL *Anas acuta*

G. High numbers for the species (Jan. and late in year) again reported from the New Grounds; combined total of 185 on Estuary and in W.T. enclosures, Jan. 24 (H.J.B.) and totals of 270 and 400 in same enclosures, Dec. 22 and 24 respectively (H.J.B., P.S.).

S. Noted, Blagdon res., only in very small numbers—chiefly in period Oct.-Dec. (various observers). Reported from Chew Valley, frequent intervals, Jan.-late Apr. and Nov.-Dec. (E.G.B., B.K. *et al.*), with max. counts of 32, Feb. 24; 21, Nov. 24 (G.C.B., S.I.B.); and 18, Dec. 26 (P.J.C.). Coastal record of 14, Sand Bay, Nov. 16 (T.B.S.).

SHOVELER *Spatula clypeata*

G. Largest count, New Grounds (Estuary and W.T. enclosures) —94, Dec. 22 (H.J.B.). Two females, Severn Beach, Dec. 1 (G.C.B., S.I.B.).

S. Reported from Blagdon res., various dates, Jan.-Feb. and in Nov.-Dec. (B.K.B., W.L.R. *et al.*), with max. totals of 32, Feb. 27 (G.C.B., S.I.B.) and 18, Nov. 27 (B.K.). Present Chew Valley res. at all seasons, with peak counts of 130-170 in Mar. (G.C.B., B.K.) and 92-128 in Oct. (P.J.C., M.A.W.). The only note from Cheddar res. is of six, Nov. 23 (B.K.). Breeding records show that *c.* 30 pairs were resident and attempted to breed at Chew Valley but owing largely to interference by Carrion Crows only six broods are known to have reached the water (H.J.B., B.K.).

SCAUP *Aythya marila*

S. One, ad. male, Chew Valley res., early Jan. to end of Apr. (G.C.B., A.C.L., S.G.M. *et al.*) and up to four or five, various dates, mid-Nov. to late Dec. (P.J.C., B.K., M.W.P. *et al.*). Single females, Barrow Gurney resrs., Feb. 10 (D.A.H., W.A.H.); Blagdon res., Feb. 17, Dec. 1 (B.K.); and Cheddar res., Oct. 13, Dec. 8 (J.A.McG.). Coastal records of four off Brean Down (Weston Bay), Dec. 23, 26 (T.B.S., M.A.W.).

TUFTED DUCK *Aythya fuligula*

S. Large numbers, Chew Valley res., Mar.-Apr. and Nov.-Dec. (G.C.B., S.I.B. *et al.*), with peak totals of 418, Mar. 30 ; 360, Apr. 22; 519, Nov. 30; 695, Dec. 14, and 564 on 22nd (B.K.). Summer counts of 100-226, same place, on various dates, May-July (P.J.C., B.K., M.A.W.), while breeding observations by H.J.B. and B.K. show that at least 23 pairs bred successfully. At Blagdon res., where two females may have nested but no young seen, numbers varied from 95-160 in period Jan.-Mar. (B.K.B., M.A.W. *et al.*) and from 70-244 in period Aug.-Dec. (G.C.B., P.T. *et al.*). Plentiful, Cheddar res., throughout Jan., with max. of 170 on 27th (J.A.McG.), but as numbers seldom exceeded 40 for remainder of year it seems likely that the majority moved to Chew Valley (H.H.D.). Other reservoir counts are of 57, Barrow Gurney, Jan. 6 (M.A.W.) ; 43, same place, Feb. 24 (G.E.C.) ; and 20, Chew Magna, Nov. 27 (P.J.C.).

POCHARD *Aythya ferina*

S. Again in considerable numbers, Cheddar res., Jan. and mid-Oct. to end of year (B.K., W.L.R. *et al.*), with max. totals of 650, Jan. 6 (J.A.McG.) ; 595, Oct. 14 (M.A.W.) ; 950, Nov. 10, and 890 on 24th (J.A.McG.). Numbers, Blagdon and Chew Valley resrs., seldom in excess of 200, and often many fewer (S.E.C., P.T. *et al.*), but high counts at Blagdon of 400, Feb. 3 (G.C.B., S.I.B.) and 620, Nov. 30 (B.K.) probably due to birds driven out by sailing disturbances at Cheddar. The only noteworthy record from Barrow Gurney is of 31, Dec. 27 (G.E.C.).

GOLDENEYE *Bucephala clangula*

S. Blagdon res. : reported on various dates, Jan.-early Apr. (G.G.C., J.A.P., W.L.R. *et al.*), with max. of 12, Feb. 24 (E.G.B., P.T.). Three, same place, Nov. 10 (S.E.C.), Dec. 26 (P.J.C.), but S.G.M. records 20, Dec. 31. Up to ten, various occasions, Cheddar res., Jan.-Feb. (B.K., J.A.McG.) and up to four, Oct.-Dec. (J.A.McG., M.W.P.). Reported from Chew Valley res., several dates, Jan.-Apr. and Nov.-Dec. (S.E.C., M.A.W. *et al.*), with max. of 14, Feb. 24 (G.C.B., S.I.B.), Mar. 30 and Dec. 6 (B.K.).

LONG-TAILED DUCK *Clangula hyemalis*

S. A female, Cheddar res., was first reported, Oct. 26 (G.G.C.) and remained to end of year (P.J.C., B.K., J.A.McG., M.W.P. *et al.*).

COMMON SCOTER *Melanitta nigra*

G. Single male on the Estuary, New Grounds, June 29 (H.J.B.).

S. Female, Cheddar res., Mar 31 (B.K., J.A.McG.). One, male, on R. Axe, Uphill, Aug. 29 (R.A.) and one, female or immature, in flight off Sand Point, Oct. 12 (T.B.S.).

GOOSANDER *Mergus merganser*

S. Scarcer at the reservoirs than in recent years. Records of three, Cheddar, Jan. 5 (J.A.McG., N.W.), 6 (B.K.) and single birds, Mar. 10 (J.A.McG.), Dec. 6 (B.K.), and of two, Chew Valley, Jan. 19 (G.G.C.) ; Nov. 24 (G.C.B., S.I.B.) and one, Dec. 6 (B.K.).

SMEW *Mergus albellus*

S. Noted at frequent intervals, Blagdon res., early Jan.-early Mar. (E.G.B., S.E.C., W.L.R. *et al.*), with max. of six or seven, Feb. 24 (B.K.B., J.A.P., N.W.). Reported once only, Cheddar res.—a single bird, Jan. 27 (J.A.McG.), while records from Chew Valley include those of seven, Jan. 27 (G.C.B., S.I.B.) and four, Dec. 22 (B.K.). Barrow Gurney reports are of one, Feb. 24 ; two, Mar. 3 ; and one, Dec. 22 (W.A.H.).

SHELDUCK *Tadorna tadorna*

G. New Grounds : 200 on Estuary, Feb. 20—an unusually high figure for the date ; 173, same place, Mar. 3 (H.J.B., J.V.B.). Observations at the New Grounds, mid-Aug., showed that only 21 ducklings reached fledging age (H.J.B., P.J.O.). Thirty-four, Oldbury-on-Severn, Dec. 1 (T.D.H.M.).

S. Frequent counts in coastal areas—Yeo Estuary, Sand Bay and Weston Bay—varied from 40-127 in period Jan.-Apr. and from 85-200 in period July-Dec. (R.A., W.L.R.). Reservoir records include those of three, Barrow Gurney, Feb. 10 (D.A.H., W.A.H.) ; two, Cheddar, Mar. 24 (J.A.McG.) ; and at least two pairs, Chew Valley, various occasions, Apr.-Aug. (P.J.C., M.A.W. *et al.*), one of which bred successfully (H.J.B., N.W., R.F.W.).

WHITE-FRONTED GOOSE *Anser albifrons*

G. Numbers at the New Grounds (1,700 at close of 1956) had increased to 2,700, Jan. 24, and 3,300, Feb. 2, but were down to 1,860, Mar. 3 ; rapid decline thereafter—two, Mar. 18, being the last seen (H.J.B. *et al.*). One, evidently an immature White-front, Yate Common, Jan. 21 (J.A.P.). First autumn record, New Grounds : single bird, Sept. 26, but rapid increase to 920 by Oct.

22 (unusually high for the date). Subsequent max. counts of 1,100, Nov. 28, and 2,200 Dec. 28 (H.J.B. *et al.*).

S. About 40 geese, probably White-fronts, flying S.E. off Brean Down, Feb. 2 (R.A.). Six in flight, St. George's Wharf, Portbury, Dec. 14 (N.W.). Nineteen, Chew Valley res., Jan. 19 (G.G.C., N.W.) and 35 on 20th (B.K.). 26, same reservoir, Dec. 26 to end of year (A.E.B., D.R.J.C., P.J.C., P.F. *et al.*).

Lesser White-fronted Goose *Anser erythropus*

G. First-winter bird, New Grounds, Jan. 19; two adults, same place, mid-Jan. to early Mar. (H.J.B., M.D., P.S. *et al.*).

Bean Goose *Anser arvensis*

G. One, first seen in previous Dec., still present, New Grounds, Jan. 6 (H.J.B.).

Pink-footed Goose *Anser brachyrhynchus*

G. One, immature, New Grounds, Jan. 10-Feb. 26 and single ad., Feb. 26-Mar. 15. Four, same place, Sept. 29, were the first autumn birds, but sharp increase to 136, Oct. 6, with max. count of 137 on 15th. Marked decline to 87, Nov. 6, with numbers less than 50 later in month and not exceeding half a dozen at any time in Dec. (H.J.B.).

Brent Goose *Branta bernicla*

G. First-winter bird of dark-breasted form *B. b. bernicla*, at New Grounds, Dec. 22-31 (H.J.B., P.S. *et al.*).

Barnacle Goose *Branta leucopsis*

G. One in first-winter plumage, New Grounds, Dec. 5 to end of year (H.J.B. *et al.*).

Canada Goose *Branta canadensis*

S. Two, Chew Valley res., various dates, Apr. 13-May 26 (E.G.B., G.G.C., R.F.W. *et al.*).

Mute Swan *Cygnus olor*

S. Peak totals at the reservoirs from July, with max. at Blagdon of 67, July 21 (B.K.) and 63, Aug. 17 (P.J.C.), and of 60-98 on various occasions, Chew Valley, late Sept. to end of year (S.E.C., R.A.P., W.L.R. *et al.*). Winter counts on R. Avon at Old Bridge, Bath, again returned at *c.* 70, with average summer population (non-breeding) of *c.* 50 (B.K.).

BEWICK'S SWAN *Cygnus bewickii*

G. Up to 15, New Grounds, for most of Jan., and single bird, Feb. 4; family party of five, same place, Dec. 2-10 and again on 19th. Birds often seen in W.T. enclosures, usually in early mornings—otherwise on Estuary (H.J.B., M.D., S.T.J. *et al.*).

S. Eleven, Blagdon res., various dates, Jan. 3-27 (B.K.B., G.C.B., N.W. *et al.*); family party of seven, same reservoir, Dec. 1, 7 (B.K.). Sixteen flying S. over Long Ashton at 10.30 hrs., Dec. 31; similar number, Blagdon res., later in the day (15.30 hours.) were probably the same birds (G.E.C., M.A.W.).

BUZZARD *Buteo buteo*

G. One, Oldbury-on-Severn, Mar. 3 (J.K.) and two soaring over Sea Mills, Sept. 8 (H.W.N.).

S. Reported from a number of localities, chiefly Mendip area, but little information on breeding success. Pair with single juvenile, Hutton Wood, Aug. 3 (per W.L.R.) and adult with two juveniles, Walton Moor, Clevedon, Aug. 6 (G.E.C., M.A.W.).

KITE *Milvus milvus*

G. One over Tockington flying south-west at approx. 300 ft., Mar. 3, seen by A.E.B., who has supplied a confirmatory field description. Salient features noted were the large size, forked tail, and wings longer and less rounded than in Buzzard, with characteristic light patches on undersides.

HEN HARRIER *Circus cyaneus*

G. Close views obtained of two females or immatures nr. Wildfowl Trust enclosures, New Grounds, Dec. 30, 1956 (P.H.).

S. Female or immature, Chew Valley res., Jan. 13 (B.K.).

HOBBY *Falco subbuteo*

G. One in flight, Downend, June 5 (R.H.P.).

PEREGRINE *Falco peregrinus*

S. Frequently seen outside breeding season between Clevedon and Brean Down, but no evidence of breeding at coastal, or inland, eyries. Reservoir records include those of single birds, Chew Valley, Jan. 6, Mar. 31 (B.K.); male, Blagdon, Mar. 11 (E.G.B.) and single bird, same place, Nov. 9 (E.G.B., S.E.C.). One seen to strike Jay which fell into *Spartina* and was not retrieved, Axe Estuary, Oct. 4 (R.A.).

MERLIN *Falco columbarius*

G. Male in flight, Yate, Mar. 1 (H.W.N.).

KESTREL *Falco tinnunculus*

G. A pair bred in the tower of St. Stephen's Church, City Centre, and reared four young (G.C.B.).

RED-LEGGED PARTRIDGE *Alectoris rufa*

S. One preening on stone wall, Sand Point, Mar. 16, and three seen, Uphill on 29th (R.A.).

WATER RAIL *Rallus aquaticus*

S. Two in *Spartina*, Sand Bay, Jan. 19, 20, and one calling, same place, Oct. 27 (R.A.). One seen and twice heard, Chew Stoke, in early summer (T.H.P.).

CORNCRAKE *Crex crex*

S. One disturbed from grass ley, Long Ashton, Apr. 25 (F.H.). Bird frequently calling in mowing grass, Compton Martin, from June 9, was killed by mower on 26th : no nest found (T.H.P.).

COOT *Fulica atra*

S. In contrast to previous year (when late Feb. peak of 1,700 occurred—*cf. Proc. B.N.S.*, 1956, p. 198), Cheddar res., population showed early decline from winter maximum of 2,300, Jan. 20 to 1,400 on 27th and 380, Feb. 24. Highest totals, Chew Valley : 1,640, Jan. 27 (G.C.B., S.I.B.) ; 1,500, Aug. 5 (B.K.) and 1,175, Sept. 15 (P.J.C.). Small autumn population again noted, Blagdon —max. number, 450, Dec. 12 (G.C.B., S.I.B.). Seven pairs bred, Newton Park, Newton St. Loe. (M.F., B.K.).

OYSTERCATCHER *Haematopus ostralegus*

G. Single bird, W.T. enclosures, New Grounds, Oct. 25 (M.D.).
S. 108, Axe Estuary, Feb. 14 (W.L.R.) ; up to 140, Weston Bay, Aug. 15-Sept. 27 (R.A.) ; 98, same place, Dec. 23 (T.B.S.) ; and ten, Clevedon, Dec. 14 (P.F.). Two, Chew Valley res., Aug. 11 ; single bird, same place, Sept. 1 (P.J.C., M.A.W.).

LAPWING *Vanellus vanellus*

G. Present in large numbers, New Grounds, Jan.-Feb. ; up to 1,770, Feb. 4, 16 (H.J.B., B.K.).

S. 550, mouth of Avon, Feb. 2 (P.J.C.) ; *c.* 750, Weston aerodrome, Aug. 29 (W.L.R.). Reservoir records of 350, Blagdon, Aug. 18, and 800, Chew Valley, Dec. 14 (B.K.).

RINGED PLOVER *Charadrius hiaticula*

G. About 50, Oldbury-on-Severn, Jan. 10 and 131, Chittening Warth, Nov. 17 (T.D.H.M.).

S. Counts at Sand Bay include : 53, Feb. 10 ; 101, May 11 ; 270, Aug. 17 ; and 88, Sept. 27 (T.B.S.). Sixty-two, Weston Bay, Dec. 11 (R.A.). Reservoir records of six, Chew Valley, May 8 (R.J.L.) ; 20, same place, Aug. 11 (B.K.) and three, Sept. 21 (M.W.P.) ; single birds, Cheddar, Aug. 11 (B.K.) and Blagdon, Aug. 31 (P.J.C.).

GREY PLOVER *Charadrius squatarola*

S. Reported only from Woodspring-Sand Bay area : two, May 13 ; single birds, Sept. 19, Oct. 27 ; three, Nov. 17 ; and four, Dec. 28 (R.A., T.B.S.).

GOLDEN PLOVER *Charadrius apricarius*

S. 200 or more, Yeo Estuary, Jan. 3 (C.D.G.G.) ; 53, Lulsgate aerodrome, Sept. 22 (B.K.) and 91, Dec. 1 (P.J.C., M.A.W.); 175, Marksbury, Nov. 9 and an exceptional gathering of 570, same place, Dec. 21 (B.K.), but numbers down to 117 on 23rd (R.J.L.). Twenty-six, Chew Valley res., Oct. 6 (T.D.H.M.) and 30, Blagdon res. on 9th (G.C.B., S.I.B.).

TURNSTONE *Arenaria interpres*

G. Two, in summer plumage, on the Estuary, New Grounds, May 18 (N.W.) and five on 28th (M.D.). 125, Severn Beach, Sept. 5 (H.W.N., M.A.W.).

S. Single birds inland : Chew Valley res., May 8 (B.K.) and Cheddar res. on 12th (J.A.McG.). Coastal reports of seven, Clevedon, Aug. 6 (N.W.) ; single birds, Weston Bay, Aug. 13, Sept. 11 ; and Sand Bay, Aug. 25 (R.A.).

CURLEW *Numenius arquata*

G. 540, New Grounds, Feb. 4 (H.J.B.) ; 300-400, same place, June 21 (P.J.O.).

S. Twenty, Chew Valley res., Jan 6 (B.K.).

BLACK-TAILED GODWIT *Limosa limosa*

G. Two, New Grounds, July 12 (M.D.) and seven on 13th (H.J.B.) ; present in small numbers during Aug. with max. of nine on 30th (M.D.) ; at least 40, same place, Sept. 22, and 35 on 28th (H.J.B.). 75, Sheperdine, Sept. 29 (W.A.H., T.D.H.M.).
S. Single birds, Chew Valley res., Mar. 2, Apr. 20 (B.K.). Three, Yeo Estuary, May 9 (W.L.R.) ; two, same place, July 21 (T.B.S.) ; two, Kingston Seymour, July 28 (P.J.C.) ; and 12, Weston Bay, Aug. 29 (R.A.).

BAR-TAILED GODWIT *Limosa lapponica*

G. Single birds on Estuary, New Grounds, Mar. 19 (M.D.), June 29 (H.J.B.), and July 23 (M.D.) ; two, same place, Sept. 26, 28 (H.J.B.). One, Sheperdine, Sept. 29 (W.A.H., T.D.H.M.).
S. Four, Chew Valley res., Apr. 26 (S.G.M.). Two, Sand Bay, Aug. 25, and single birds, Weston Bay, various dates, Oct. 7-Dec. 12 (R.A.).

GREEN SANDPIPER *Tringa ochropus*

G. Single birds, Sheperdine, Oct. 27, and Oldbury-on-Severn, Dec. 25 (T.D.H.M.).
S. One, Chew Valley res., Apr. 23 ; five, same place, June 20 and four on 27th (B.K.). Present in small numbers, Blagdon and Chew Valley resrs., Aug. 5-Oct. 12, with max. of nine, Chew Valley, Aug. 11 (various observers) ; one, same place, Nov. 3 (B.K.). Single birds, Wick St. Lawrence, July 20 (T.B.S.); Woodspring Bay, Aug. 24 (R.A.) and Sept. 9 (T.B.S.).

WOOD SANDPIPER *Tringa glareola*

S. Single birds, Chew Valley res., Aug. 19-26 (S.G.M.) and Sept. 14, 22 (G.G.C.).

COMMON SANDPIPER *Actitis hypoleucos*

S. One, perhaps wintering, Chew Valley res., Nov. 30 (B.K.).

REDSHANK *Tringa totanus*

S. Max. coastal counts of 120, mouth of Avon, Feb. 2 (P.J.C.) ; 176, Sand Bay, Feb. 9 (T.B.S.) and *c.* 175, July 13 (R.A.) ; and *c.* 150, Axe Estuary, Sept. 23 (R.A.). At least four pairs, two of them with small young, Kenn Moor, May 15 (T.B.S.). Fourteen, apparently paired, Chew Valley res., May 25 (B.K.).

Spotted Redshank *Tringa erythropus*

G. Single bird on Estuary, New Grounds, July 13-23 (H.J.B. *et al.*); another, same place, Aug. 30 (M.D.). Two in flight, Severn Beach, Sept. 15 (H.H.D.).

S. One, Blagdon res., various dates, Jan.-Feb. (S.I.B., N.W. *et al.*) and three, Feb. 24 (E.G.B., B.K., J.A.P.); single birds, same place, Sept. 5, Oct. 9 (S.I.B.) and Nov. 27 (B.K.). Single birds, frequently seen, Chew Valley res., Feb. 24-Nov. 30 (B.K. *et al.*); one " shot in error ", same place, Dec. 21 (R.J.B. per G.H.E.Y.) and one still present on 26th (P.J.C.).

Greenshank *Tringa nebularia*

G. Single birds, W.T. enclosures, New Grounds, Aug. 1, 10 and 30 (M.D.).

S. One, Chew Valley res., June 26 and three on 28th (B.K.); one, sometimes two, same reservoir, Aug. 11-Sept. 21 (various observers) and three, Sept. 22, 29 (D.R.J.C., M.W.P.). Single bird, Cheddar res., Aug. 4, 11 (B.K., J.A.McG.). Three, Blagdon res., Aug. 17, 31, and four, Sept. 8 (P.J.C., M.A.W.); three or four, same place, Sept. 15 (W.A.H. *et al.*)—thereafter single birds, Sept. 22-Nov. 3 (various observers). One, perhaps wintering, Blagdon, Nov. 27 (B.K.).

Knot *Calidris canutus*

G. 80-90, Oldbury-on-Severn, Jan. 11 (T.D.H.M.) and 53 Sheperdine, Sept. 29 (W.A.H., T.D.H.M.).

S. Forty, Clevedon, Jan. 27 (P.J.C., M.A.W.). Counts, Sand Bay-Weston Bay area, include: 166, Jan. 28 (W.L.R.); 52, Sept. 8; 58, Oct. 8; and *c.* 75, Dec. 6 (R.A.). Inland records: one, Cheddar res., Sept. 8 (J.A.McG.) and up to three, Chew Valley res., several occasions, Sept. 22-Oct. 1 (D.R.J.C., H.H.D., M.W.P. *et al.*).

Little Stint *Calidris minuta*

G. About 15 on Estuary, New Grounds, Feb. 18 (P.J.O.) and two on 27th (H.J.B.); single birds, same locality, on two occasions, Sept.-Oct. (M.D., T.P.W.).

S. Single bird, Weston Bay, July 26 (R.A.) ; up to four, Sand Bay, Sept. 21-26 (R.A., W.L.R., T.B.S.). Records from Chew Valley res. include : one, Sept. 21 (M.W.P.) ; three, Sept. 26 (H.W.N.) ; four, Sept. 28 and eight on 29th (B.K.) ; and one, Oct. 6 (D.R.J.C.).

CURLEW SANDPIPER *Calidris testacea*

S. Single bird, Weston Bay, Sept. 3 (R.A.) ; one, Sand Bay, Sept. 7, 8, 23 (R.A., T.B.S.) and three on 25th (T.B.S.). A juvenile, Chew Valley res., Sept. 28, 29 (M.W.P.), Oct. 1 (D.R.J.C.).

SANDERLING *Crocethia alba*

G. Two on Estuary, New Grounds, Aug. 27 (P.J.O.).

S. Four, Sand Bay, May 13 (T.B.S.) and eight, July 27 (R.A.). In small numbers at coastal localities, Aug.-Sept.—usually up to ten or so, but 54, Weston Bay, Aug. 31 (R.A.) and 30, Sand Bay, Sept. 1, 7 (R.A., T.B.S.).

RUFF *Philomachus pugnax*

G. Three on the Estuary, New Grounds, Aug. 30 ; eleven, same place, Sept. 24 (M.D.) and three on 26th (H.J.B.).

S. Records from Chew Valley res. include : five, May 26 ; four, Aug. 18 (B.K.) ; six, Aug. 21 (S.G.M.) ; and four juveniles, Sept. 21 (M.W.P.). Party of five, Uphill, Aug. 31 (W.L.R.) and single bird, Sand Bay, Sept. 22 (R.A.).

GREY PHALAROPE *Phalaropus fulicarius*

S. Single bird, Chew Valley res., Nov. 3, 4 (E.G.B., P.T. *et al.*).

LESSER BLACK-BACKED GULL *Larus fuscus graellsii*

S. Breeding again took place at Chew Valley res. but no reliable nest count available (P.J.C., B.K.). Reports by same observers indicate that the roost at this res. was again occupied throughout year—max. count of 500, Nov. 3. Adult ringed, Steep Holm 10/4/50, found dead, Barrow Gurney resrs., 10/6/57 and bird ringed as juv., 9/7/52, seen (ring number read) on Flat Holm, Mon., 26/5/57, where mixed colony of *fuscus* and *argentatus* has recently been established (Res. Stn.).

SCANDINAVIAN LESSER BLACK-BACKED GULL *Larus fuscus fuscus*

G. One considered to be of this form, seen in enclosures, New Grounds, several occasions, Oct.-Dec. (B.K., Jnr. Sect.).

HERRING GULL *Larus argentatus*

G. Pair bred successfully, Aust Cliff, single chick being reared (J.S.W. per *Western Daily Press*, 12/8/57). Third breeding record for Gloucestershire side of district—cf. *Proc. B.N.S.*, 1952, p. 325.

S. At least 1,000 roosting, Chew Valley res., Aug. 28 (B.K.). One ringed as fourth-year bird, Steep Holm, 13/11/55, found dead, Flat Holm, Mon., 26/5/57 (Res. Stn.)—see also under Lesser Black-backed Gull.

GLAUCOUS GULL *Larus hyperboreus*

S. Remains of immature bird found in tide-wrack, Clevedon, Dec. 12 (D.A.W., R.F.W.).

LITTLE GULL *Larus minutus*

S. Juvenile, Cheddar res., Aug. 25 (E.G.B., B.K., P.T.), and a first-winter bird, Chew Valley res., Dec. 26, 27 and 29 (A.E.B., P.J.C., M.A.W.).

SABINE'S GULL *Xema sabini*

S. Juvenile, feeding with Black-headed Gulls on mudflats (also seen in flight), Weston-super-Mare, Sept. 23 (R.A.). Descriptive details supplied include: small size, white forehead, black primaries and grey-brown leading edge of rest of wing, white triangular patches on secondaries, and slightly forked tail.

KITTIWAKE *Rissa tridactyla*

G. & S. After a series of severe gales over the eastern Atlantic lasting from Jan. 25 to early Feb., a 'wreck' occurred on the west coast of Britain. Only one report for Gloucestershire side of district—single ad. found dead in canal, Slimbridge, Feb. 16—but numerous records received from N. Somerset, these being mainly from the coast and Cheddar reservoir. The minimum loss is estimated to be 104, composed of 97 dead and 7 live birds which doubtless did not survive (various observers).

Coastal records: Sand Bay/Weston Bay area—22 live, 1 dead, Feb. 10; 6 live, 4 dead, Feb. 16; 11 dead on 25th and 8 more dead subsequently; R. Yeo—Kingston Seymour, 5 dead, Feb. 24; Clevedon—7 live, 3 dead, Feb. 16, and 2 live on 24th; Portishead—7 or 8 live, 2 dead, Feb. 16, and 1 live on 24th; Steep Holm—3 dead, Mar. 28.

Inland records: single birds found dead, Barrow Gurney and Blagdon resrs., Feb. 10, and Long Ashton on 14th. At Cheddar res., 26 dead found, Feb. 19-Mar. 11; 2 living, March 24 and 1 on 31st: a further 30 reported to have been buried by reservoir keeper. Single birds in flight, R. Avon, Bedminster, Bristol, Feb. 14, 15, and Keynsham in early March.

Single immature, Cheddar res., Aug. 25; two on 26th, and another, Nov. 3 (E.G.B., J.A.McG. *et al.*).

Black Tern *Chlidonias niger*

G. At least ten over R. Severn, New Grounds, on morning of Sept. 26 (P.J.O.) and three in afternoon (H.J.B.).

S. Few spring records: one, Cheddar res., May 25 (B.K.) and five on 26th (J.A.McG.); 17, Chew Valley res., May 25, 18 on 26th and two on 29th (B.K.). Numbers in August small, as last year, but following similar weather conditions to those associated with movements of the species in recent years—frontal disturbances with light to moderate easterly winds and heavy cloud and precipitation over the whole of the east coast and adjacent continental coastline from Norway to northern France (cf. *Brit. Birds*, XLVIII, pp. 300–307)—a remarkable influx took place, over 500 being reported from the resrs. on Sept. 21 (30, Cheddar (W.A.H.) and 480, Chew Valley—largest inland count for Gt. Britain (M.W.P.)). All N. Somerset resrs. visited on following day by P.J.C., H.H.D. and M.A.W. who counted *c.* 280 (12, Barrow Gurney; 62, Blagdon; 18, Cheddar; and 191 ± 10, Chew Valley). Numbers smaller thereafter with counts returned of 16, Chew Valley, Sept. 27 (B.C.P., E.M.P.); 30, same place, Sept. 28 (H.G.A., B.K.) and 12 on 29th (M.W.P.); five, Cheddar, Sept. 28 (W.A.H.) and ten on 29th (J.A.McG.). Single birds, Chew Valley, Oct. 6 (N.W.), 12 (M.W.P.).

Coastal records: one feeding over rough pasture on coast, Clevedon, Aug. 6 (D.A.W., N.W., R.F.W.) and one behaving similarly, Woodspring Bay on 10th (R.A.)—vide *Brit. Birds* L, p. 538; four, Axe Estuary, Sept. 23 (R.A.); four, Sand Bay, Sept. 24 and two on 26th (T.B.S.).

Common Tern *Sterna hirundo* Arctic Tern *Sterna macrura*

S. Only two spring records—single birds, Chew Valley res., May 10, 11 (G.C.B. *et al*). Frequently reported, usually single birds, from reservoirs with maxima of six, Cheddar, Aug. 11 (B.K.) and 15 on 26th (N.W.); seven, Chew Valley, Sept. 22 (M.W.P.) and eight on 29th (B.K.). Parties of eight, Sand Bay, Sept. 23, and six off Sand Point on 25th (T.B.S.).

LITTLE TERN *Sterna albifrons*

S. One, Blagdon res., July 5, 1956 (C.S.L.).

RAZORBILL *Alca torda*

S. Freshly dead adults on shore, Sand Bay, Mar. 18 (T.B.S.) and 31st (R.A.) ; dead juvenile, Clevedon, Aug. 30 (D.A.W., N.W., R.F.W.).

BARN OWL *Tyto alba*

G. Single birds noted in breeding season, Milbury Heath, May 29, and Engine Common, nr. Yate, June 7 (J.A.P.).

S. Successful breeding reported from sites near Cheddar res. (G.S. *et al.*) ; two localities at Chew Valley res. (D.A.W., R.F.W.) ; and Portishead (N.J.B.).

SHORT-EARED OWL *Asio flammeus*

S. One hunting over plantation, Priddy Pool, Mendip, April. 16 (S.G.M.) and another, dead, Clevedon, Nov. 28 (D.A.W., R.F.W.).

KINGFISHER *Alcedo atthis*

G. Seen frequently along R. Boyd (D.R.H.). Single bird on R. Trym, Coombe Dingle, Feb. 24 (W.A.H.) and a pair, Sea Mills, Mar. 24 (H.W.N.). One, Sneyd Park Lake, Nov.-Dec.

S. Noted in breeding season at the reservoirs, Newton Park, Hunstrete Park and Monk's Wood res., nr. Bath ; on R. Avon, Saltford ; and R. Chew, Chewton Keynsham (various observers).

GREAT SPOTTED WOODPECKER *Dendrocopos major*

G. Two, male and female, stripped most of bark from pear tree, suburban garden, Bishopston, Bristol, Sept.-Dec. (D.A.W., R.F.W.).

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. One nr. Wick, Dec. 7 (D.R.H.).

S. Pair, Blagdon, Apr. 11 (T.D.H.M.) and single birds, Mar. 3, June 27 (B.K.) and Nov. 10 (P.J.C., M.A.W.). Single birds also reported from suburban garden, Bishopston, Sept. 24 (D.A.W., R.F.W.) ; Sand Bay, Oct. 3 ; and Uphill, Dec. 14 (R.A.).

WOODLARK *Lullula arborea*

S. The only breeding record is of an adult with four juvs., Crook Peak, May 4 (R.A.).

HOUSE MARTIN *Delichon urbica*

S. Three in flight over Weston Woods on late date of Nov. 17 (R.A.).

RAVEN *Corvus corax*

S. Three young reared, Brean Down (W.L.R. *et al.*), but no other breeding records. Frequently seen over Weston-super-Mare flying to and from Town Quarry where up to five roosted intermittantly from June to Aug. and up to three thereafter (R.A.).

JAY *Garrulus glandarius*

G. Exceptional movement reported from New Grounds area, Oct. 1-5—three flocks totalling over 50 birds seen flying northwards in one hour on morning of 3rd (H.J.B., M.D., S.T.J.).

GREAT TIT	*Parus major*	BLUE TIT	*Parus caeruleus*
COAL TIT	*Parus ater*	MARSH TIT	*Parus palustris*

S. What appeared to be unusual numbers in Weston Bay area, mid-Sept. to mid-Oct. Migratory behaviour noted by small flocks of Blue Tits totalling *c.* 50 birds, Sand Point, Sept. 19 and a Coal Tit and three Marsh Tits also present on 21st (T.B.S.). On Steep Holm, two Great Tits, 12 Blue Tits and two Coal Tits seen, Oct. 5 and at least 20 Blue Tits and six Coal Tits present on following day (Res. Stn.).

Two Blue Tits trapped, Long Ashton, late December, had both been ringed as adults, same place, five years earlier on 17/12/52 (G.E.C.).

TREECREEPER *Certhia familiaris*

S. One in trees over landing beach, Steep Holm, Oct. 5 (Res. Stn.)—first record for the island.

DIPPER *Cinclus cinclus*

G. Single birds, Little Avon River, Kingswood, July 13 (T.D.H.M.) and R. Boyd, nr. Wick, Oct. 5 (D.R.H.).

MISTLE THRUSH *Turdus viscivorus*

S. See under Song Thrush.

SONG THRUSH *Turdus ericetorum*

S. Six seen leaving Steep Holm on morning of Oct. 5. Birds circled overhead to gain height and, joining up with two Mistle

Thrushes, departed in a westerly direction; three more seen leaving on 6th (Res. Stn.).

RING OUZEL *Turdus torquatus*

S. Single male, Crook Peak, Mar. 23 (R.A.).

WHEATEAR *Oenanthe oenanthe*

S. Three pairs bred successfully, Wavering Down, Compton Bishop, nine young being reared (P.J.M.N.).

BLACK REDSTART *Phoenicurus ochruros*

S. One, female or immature, in private gardens, Bath, Nov. 10 (A.C.G., B.E.G.).

GRASSHOPPER WARBLER *Locustella naevia*

G. Singing males in garden, Clifton, Apr. 20 (P.J.C.); in hedgerow between Hambrook and Harry Stoke, Apr. 23 (R.H.P.); and at Codrington, June 11 (J.A.P.).

S. One in song, Chew Valley, May 5 (B.K.), and at least three, Walton Moor, Clevedon on 11th (R.A.).

WOOD WARBLER *Phylloscopus sibilatrix*

G. & S. Seven singing males resident in area of *c.* 288$\frac{1}{4}$ sq. kms. (111$\frac{1}{4}$ sq. miles) enclosed by the following boundaries: R. Avon from Bristol to Batheaston, County boundary north to Tormarton, and roads through Old Sodbury—Yate—Iron Acton—Rudgeway—Patchway—Filton—Bristol. (2 males, Lygrove Grove, St. Catherine; 2, Aldermoor Wood and 1, Soper's Wood, Charlcombe; 2, Beaulieu nr. Kelston (Survey by 10 members and 3 Bath N.H. Soc. members).

GOLDCREST *Regulus regulus*

S. One, Steep Holm, Mar. 29; three caught and ringed, same place, Oct. 5-6 (Res. Stn.).

TREE PIPIT *Anthus trivialis*

S. Plentiful in breeding season around Chew Valley res. (B.K.).

ROCK PIPIT *Anthus spinoletta petrosus*

S. Reservoir records (presumably this race): one, Cheddar, Sept. 29 (B.K.); two, same place, Oct. 6, and three on 13th (J.A.McG.). Twelve, Brean Down, Feb. 17 (P.J.C., M.A.W.).

WATER PIPIT *Anthus spinoletta spinoletta*

S. One, viewed at close range, Cheddar res., Dec. 1 by B.K., who has supplied full details.

PIED WAGTAIL *Motacilla alba yarrellii*

S. Up to 150 roosting in *Spartina*, Sand Bay, Sept.-Oct. (T.B.S.). Roost on glass roofs, W. D. & H. O. Wills', No. 1 Fty., Bedminster, Bristol, still in use Nov.-Dec. (P.J.C.)—cf. *Proc. B.N.S.*, 1951, p. 252.

WHITE WAGTAIL *Motacilla alba alba*

S. At least twelve in field adjoining Barrow Gurney resrs., Sept. 27, 28 (H.G.A., B.K.). Single bird among Pied Wagtails, Blagdon res., on late date of Nov. 9 (B.K.).

GREY WAGTAIL *Motacilla cinerea*

S. Single bird, Steep Holm, Oct. 6 (Res. Stn.).

YELLOW WAGTAIL *Motacilla flava flavissima*

S. One (male), Cheddar res. on early date of Mar. 31 (B.K.). One seen in flight and later settled on path, Steep Holm, Apr. 28 (Res. Stn.).

WAXWING *Bombycilla garrulus*

G. One in Wildfowl Trust enclosures, New Grounds, Nov. 17 (M.D.) and another feeding on cotoneaster berries, garden, Westbury-on-Trym, Nov. 20, 21 (per H.W.N.).

S. Three on cotoneaster shrub in garden, Clevedon, Dec. 15 (A.T.), and single bird, Royal Victoria Park, Bath, Dec. 8, 15 (per R.J.L.).

RED-BACKED SHRIKE *Lanius collurio*

S. Breeding reports received from Charterhouse (D.A.W. *et al*) and nr. Cheddar reservoir (per J.A.McG.).

STARLING *Sturnus vulgaris*

S. Roost, estimated at 50,000 birds, in wood, Newton St. Loe, Dec. 23 (R.J.L.).

HAWFINCH *Coccothraustes coccothraustes*

G. One in flight, Frenchay, Apr. 6 (R.H.P.) and two on the Downs, Bristol, Dec. 8 (P.J.M.N.).

S. At least three pairs, Leigh Woods—two nests found from one of which four young reared (P.J.C.).

SISKIN *Carduelis spinus*

S. Two in alders, Barrow Gurney resrs., Feb. 10 (G.E.C.). Two on Sand Point, Sept. 20 (T.B.S.)—early date for the species (Eds.).

CROSSBILL *Loxia curvirostra*

S. One, Ubley, Blagdon, Jan 15 (B.K.) and party of twelve on 19th (N.W.) ; nine still present, Feb. 3 (G.C.B., S.I.B.). Two, Abbots Leigh, Apr. 2 (A.G.D.).

CIRL BUNTING *Emberiza cirlus*

S. Reported from Portishead, Kewstoke, Bleadon and Loxton in breeding season (R.A., C.D.G.G., T.B.S.).

SNOW BUNTING *Plectrophenax nivalis*

S. Single birds reported from Cheddar res. Nov. 17 (B.K.) ; Sand Point, same date (T.B.S.) ; and Weston-super-Mare, Dec. 11 (R.A.).

TREE SPARROW *Passer montanus*

G. Partial albino, New Grounds, Feb. 16 (N.W.). Small roost of *c.* 20 birds in reeds, Almondsbury, Oct. 25 (A.E.B. *et al.*). Flock of 6-10, Wick, Dec. 26-31 (D.R.H.).

S. Approx. 20, Wick St. Lawrence, Sept. 19, and six, Sand Point, Oct. 12 (T.B.S.).

LEPIDOPTERA NOTES
BRISTOL DISTRICT, 1957

By C. S. H. Blathwayt

After one of the mildest winters for many years spring was very early and March was a fine warm month. April and May were both mainly fine but rather cold but some very warm weather was experienced in June and early July. The remainder of the Summer was, however, very disappointing and there was little fine weather until October, which once again was a good month.

The year was a bad one so far as both butterflies and moths were concerned and there is little of real interest to report from the Bristol District.

The following notes are taken from records supplied by C. L. Bell (C.L.B.), H. W. Bird (H.W.B.), A. P. Chapman (A.P.C.), and also from my own records (C.S.H.B.). As all the Weston records are my own and all those from Clevedon are by H. W. Bird I have omitted initials after records from these two places.

Colias Croceus Fourc. (*edusa* Fabr.) (Common Clouded-yellow). A few reported from Bishop Sutton from end of August to beginning of September (A.P.C.).

Argynnis aglaia Linn. (Dark Green Fritillary). Common in one locality in Mendips at end of June. One melanic var. taken (C.L.B.).

Vanessa cardui Linn. (Painted Lady). One reported from Bishop Sutton August 28 (A.P.C.).

Vanessa atalanta Linn. (Red Admiral). One seen at Bishop Sutton, April 24 (A.P.C.).

Thecla betulae Linn. (Brown Hairstreak). One female near Glastonbury, August 6 (C.S.H.B.).

Pseudoips bicolorana Fuessl. (*quercana* Schiff.) (Scarce Silver-lines). Several at light, Weston, July.

Apatele leporina Linn. (Miller). One at light, Clevedon, June 29.

Amathes ditrapezium Borkh. (Triple-spotted Clay). One at light, Clevedon, July 5.

Hadena conspersa Esp. (*nana* Rott.) (Common Marbled Coronet). Several at light, Clevedon, in June.

Apamea furva Hubn. (Confused Brindle). A few at light, Weston and Clevedon, late June and early July.

Apamea unanimis Hubn. (Small Clouded Brindle). Two at light at Clevedon in early June.

Apamea sublustris Esp. (Reddish Light Arches). Common at light at Clevedon. A few at Weston in June.

Apamea scolopacina Esp. (Slender Brindle). One at light, Weston, July 14.

Dasypolia templi Thunb. (Brindled Ochre). A few at light, Weston, late September to October.

Arenostola fluxa Hubn. (*hellmanni* Ev.((Mere Wainscot). One at light, Clevedon, July 5.

Mythimna turca Linn. (Double-line Wainscot). One at light, Weston, July 6.

Laphygma exigua Hubn. (Small Mottled Willow). One at light, Clevedon, July 2.

Cucullia chamomillae Schiff. (Chamomile Shark). One at light, Weston, March 29.

Dasycampa rubiginea Fabr. (Dotted Chestnut). Several at light, Clevedon in early March.

Pyrrhia umbra Hufn. (Bordered Orange). One at light, Clevedon, July 2.

Heliothis peltigera Schiff. (Dark Bordered Straw). One at light, Weston, March 27.

Tholomiges turfosalis Wocke (Marsh Oblique-barred). One at light, Weston, July 31.

Sterrha inornata Haw. (Plain Wave). Four at light, Clevedon, June 17.

Sterrha trigeminata Haw. (Treble-spot Wave). Several at light, in Clevedon, early June.

Discoloxia blomeri Curt. (Blomer's Rivulet). A few at light, Weston, in June.

Nyctosia obstipata Fabr. (*fluviata* Hubn.) (Narrow-barred Carpet). One at light, Clevedon, August 4.

Eupithecia succenturiata Linn. (Bordered Pug). Three at light, Clevedon, July 4 and 5.

Eupithecia valerianata Hubn. (Valerian Pug). Two at light, Clevedon, May 27, June 17.

Eupithecia inturbata Hubn. (Maple Pug). One at light, Weston, July 31.

Apocheima hispidaria Fabr. (Small Brindled-beauty) One at light, Clevedon, March, 7.

Dioryctria splendidella H.S. (Splendid Knot-horn). One at light, Clevedon, June 17.

HEMIPTERA-HETEROPTERA BRISTOL DISTRICT, 1957

By M. Ackland

The nomenclature followed is that of Kloet and Hincks *A Check List of British Insects*, Stockport 1945.

Where no dates are given the species were noted on several occasions. (G) indicates Gloucestershire, (S) Somerset, taking the river Avon as the boundary.

Mr. G. Woodroffe, of the Pest Infestation Laboratory, Slough, has kindly checked any doubtful specimens.

Cynidæ

Sehiris bicolor (Linn.) one specimen, Almondsbury (G.), July 28.

Pentatomidæ

Dolycoris baccarum (Linn.) Hibernated, common at Coombe Dingle (G.), in May.

Palomena prasina (Linn.) Abundant, Coombe Dingle (G.), in May and October.

Acanthosoma hæmorrhoidale (Linn.) One specimen on hawthorn, Clifton Downs, (G.), May 3.

Coreidæ

Rhopalus subrufus (Gmel in Linn.) Common in the spring, Coombe Dingle (G.)

Myrmus miriformis (Fall.) Abundant by sweeping, Leigh Woods (S.), in August.

Neididæ

Berytinus montivagus (M-D) One specimen, Stroud (G.), July 25.

Lygæidæ

Cymus glandicolor Hahn. Leigh Woods (S.), July 31.

Heterogaster urticæ (Fab.) One in house, Weston-super-Mare (S.), May 12.

Stygnocoris pedestris (Fall.) Abundant in moss and debris, Leigh Woods (S.), July 31.

Trapezonotus arenarius (Linn.) Abundant at Coombe Dingle (G.), May and July.

Rhyparochromus pini (Linn.) One specimen, Coombe Dingle (G.), July 24.

Drymus sylvaticus (Fab.) Coombe Dingle, Almondsbury, Brentry (G.).

Scolopostethus affinis (Schill.) Almondsbury and Clifton Downs (G.).

Tingidæ

Tingis cardui (Linn.) Clifton Downs (G.) and Flax Bourton (S.).

Nabidæ

Nabis ferus (Linn.) Abbots Leigh, Leigh Woods (S.).

N. flavomarginatus Scholtz. Coombe Dingle (G.), Flax Bourton (S.).

N. rugosus (Linn.) Leigh Woods (S.).

N. ericetorum Scholtz. Brentry, Coombe Dingle (G.), Leigh Woods (S.)

N. lativentris Boh. Abundant at Coombe Dingle (G.), in August.

N. major Costa. One specimen on hazel, Leigh Woods (S.), Sept. 22.

N. limbatus Dahl. Wickwar (G.), Leigh Woods and Abbots Leigh (S.).

Anthocoridæ

Anthocoris confusus Reut. Wickwar (G.), Leigh Woods, Long Ashton (S.).

A. nemoralis (Fab.) Clifton Downs (G.), Leigh Woods (S.).

A. nemorum (Linn.) Henbury, Almondsbury (G.)

Xylocoris cursitans (Fall.) Abundant under pine bark, Coombe Dingle (G.), in October.

Miridæ

Phytocoris tiliæ (Fab.) Tockington (G.), July 28.

P. varipes Boh. Leigh Woods (S.), July 21.

Adelphocoris lineolatus (Goeze) Abundant, Leigh Woods, in July.

Calocoris sexguttatus v. insularis Reuter. Common by sweeping nettle, Abbots Leigh (S.), June 30.

C. alpestris (M-D) Four specimens taken at Tockington (G.) by sweeping grass, May 25. Altitude 250 ft. This species has only been recorded at high altitudes in Northern England and on the Mendips. A new county record.

Stenotus binotatus (Fab.) Wickwar, Brentry (G.).

Lygus pabulinus (Linn.) Leigh Woods (S.), June 19.

L. contaminatus (Fall.) Leigh Woods (S).

L. rugilipennis Abbots Leigh, Flax Bourton (S.).

L. maritimus Stroud (G.), Portishead (S).

Orthops campestris (Linn.) Portway (G.), May 22.

Rhopalotomus ater (Linn.) Brentry (G.), Leigh Woods (S.).

Stenodema calcaratum (Fall.) Leigh Woods (S.), May 19.

S. lævigatum (Fall.) Leigh Woods (S.), August 18.

Notostira erratica (Linn.) Flax Bourton (S), August 3.

Megaloceroea linearis (Fuess.) Leigh Woods (S.), July 21.

Leptopterna dolabrata (Linn.) Brentry (G.), Leigh Woods (S.).

Dicyphus epilobii Reuter. Wickwar (G.), July 25.

D. globifer (Fall.) Leigh Woods (S.), May 25.

Cyllecoris flavoquadrimaculatus (Degeer.) One specimen by sweeping grass, Tockington (G.), May 26.

Orthotylus nassatus (Fab.) Abbots Leigh (S.).

O. tenellus (Fall.) Leigh Woods (S.).

Capsus meriopterus (Scop.) Common on hawthorn, Clifton Downs (G.).

Harpocera thoracica (Fall.) Coombe Dingle (G.), by sweeping nettles in May.

Orthonotus rufifrons (Fall.) Brentry (G.), June 20.

Phylus coryli (Linn.) Brentry (G.), June 20.

P. melanocephalus (Linn.) Common on oak, Leigh Woods (S.).

Psallus ambiguus (Fall.) On apple, Stoke Bishop (G.), June 2.

PLIOSAUR FROM PORTLAND

R. J. G. Savage

UNIVERSITY OF BRISTOL

THE occurrence of large marine reptiles in the Portlandian is rare and the find of a complete femur at *Pliosaurus portlandicus* Owen 1889 in the quarries of Portland merits note.

The bone has been completely freed from the matrix. Though broken in places, there are scarcely any fragments missing and it has been fully restored. The bone is a left femur and is very similar to the type of the species based on a right hind limb. The proximal articulation is convex, mammillated and roughly circular in section, with its anterior margin distended outward into a flattened shelf. Below the head the shaft is constricted, though remaining circular for about half of its length, after which it gradually becomes flattened dorso-ventrally and expanded antero-posteriorly. The distal border forms a long narrow crescent, expanded slightly onto the sides of the shaft anteriorly and posteriorly, thus giving firm attachment to the paddle bones. There are distinct traces of muscle scars along the posterior side of the proximal part of the shaft : these presumably carried paddle flexor muscles.

The following table gives measurements made on the recorded find, together with re-measurements on Owen's type.*

	Pliosaurus portlandicus right femur BM 40640 (type)	*Pliosaurus portlandicus* left femur 10562
Maximum length	12⅝″ (32.1 cm)	12 ⅛″ (30.8 cm)
Maximum proximal diameter . .	3⅜″ (8.6 ,,)	3½″ (8.9 ,,)
Maximum distal diameter	6″ (15.2 ,,)	5¼″ (13.2 ,,)
Maximum diameter, middle of shaft . .	2⅜″ (6.0 ,,)	2¼″ (5.8 ,,)

The specimen considered is so similar to Owen's type that there is no doubt they are the same species.

The type of *Pliosaurus portlandicus* in the British Museum (Natural History) comprises an incomplete right paddle with femur, fibula, six tarsal bones, three metatarsals and one phalanx. The British Museum collections also contain several vertebrae, fragmentary ribs and a few paddle bones, all that is known of the species, and all collected in the last century. Two of these vertebrae were described and figured by Lydekker (1890).

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* Owen (1889) gave scale drawings and quoted measurements for the femur. Regrettably the two do not correspond, nor does either compare exactly with the original. Owen's quoted measurements are correct if ' line ' is read as eighth instead of twelfth of an inch.

The specimen described was embedded in a block of Portland stone, probably from the Whit or Base Bed freestone. The specimen has recently been presented to the University, but had been in the possession of a quarry foreman for some years and the precise details of its horizon cannot now be traced.

My thanks are due to the Bath & Portland Stone Firms Ltd., for bringing the bone to notice and presenting it to the Geology Museum, University of Bristol, and also to the British Museum (Natural History) for permission to consult the type specimen.

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THE LOCAL BARNACLES

By R. Bassindale

INTRODUCTION

THE rocky shores of the British Isles are inhabited by vast numbers of barnacles which encrust and in places completely cover the rocks above low water of neap tides. The barnacles may occur at the rate of about 150 per square inch and a mile of suitable shore carries sixteen hundred million individuals with an annual output of living tissue which, when dried, weighs nearly a ton. They also produce—annually—one and a half million million larvae weighing nearly 3 cwt when dried. This abundant supply of material not only provides food for many shore animals (fish, crabs, worms, sea slugs, whelks and centipedes) but must obviously have a profound effect on the sea near the shore, for it is from the water that the barnacles derive their food during the high tide period and it is into the water that they pour, at the appropriate season, their innumerable offspring.

HABITS AND LIFE HISTORY

On examination the individual barnacle is seen to consist of a conical or cylindrical wall of over-lapping shelly plates with a hole at the top. This hole is closed by two valves which can be opened like double doors to permit the animal within to extrude its hairy legs in a rhythmic sweep. In this way it combs the water for small living organisms which are filtered out from the water and swallowed. Barnacles will take almost any living microscopic organism, whether animal or plant, whose size ranges from 1 millimetre down to about three-thousandths of a millimetre.

Barnacles are firmly cemented to the rock and knowledge of their life history indicates their origin. At the appropriate season the barnacles mate with neighbouring individuals (each barnacle is both male and female so that all eventually produce eggs) and the eggs are retained within the shell for several weeks.

They eventually hatch and the larvae are discharged into the sea water. If, at the breeding season, barnacles are chipped off the rocks and placed in a dish of sea water, the minute larvae are easily seen swimming towards the light. These nauplius larvæ (Fig. 1) live for 3 or 4 weeks in the surface layers of the sea and feed on diatoms (microscopic plants). After passing through six clearly marked growth stages they change into a non-feeding stage called the cypris larva (Fig. 1).

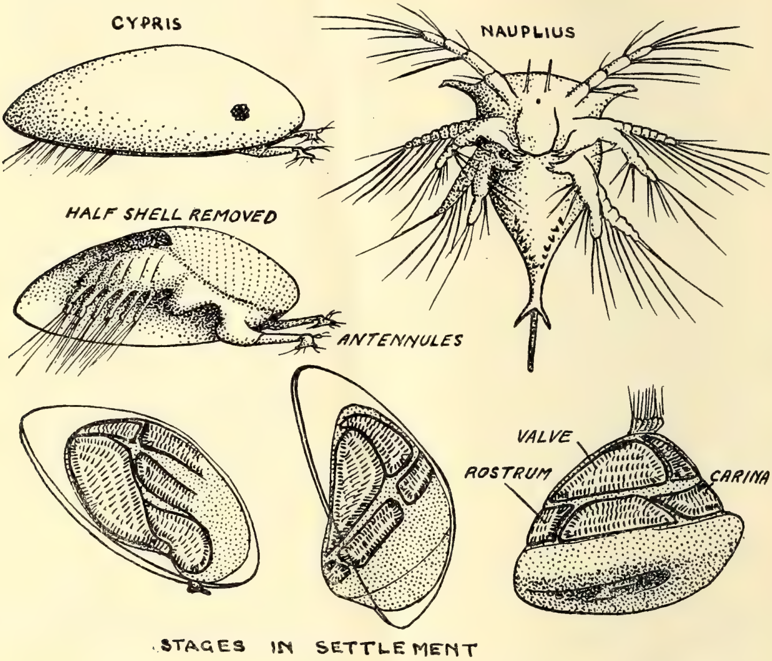

Fig. 1. The larval stages and metamorphosis of a barnacle. (Mainly after Runnstrom).

These cypris larvæ are from one half to one millimetre long and are soon attracted back to the shore and seek out a suitable place to settle. They will usually settle near barnacles of their own species and can distinguish these from other species.

Given a choice the cyprid will settle in a groove or depression rather than on a flat surface and if in a groove it will align itself with the long axis along the groove. If, however, it is on a flat surface (or in a circular depression) it will align itself along the direction of light or along the current and if these are conflicting it will choose the light direction in preference to the current direction.

Two other aspects of selection in settlement are also displayed. Cyprids belonging to a species which lives high on the shore will only settle in very strong light while others settle best in a dim light ; cyprids of species which live on wave-washed coasts will not settle at all in very sheltered localities.

It was at one time believed that the larvæ of animals like barnacles settled in their millions all over the sea bed and that those which settled in places unsuited to the adults died off leaving only those that had settled in the ' right ' places. It now seems clear from detailed studies of marine larvæ, and particularly of barnacle cyprids, that the pattern of distribution of the adults is determined mainly by the selection and choice shown by the larvæ and that this pattern is modified to only a slight extent by differential mortality.

Having selected a suitable spot for settlement the cypris undergoes a profound metamorphosis and cements itself down onto the rock where it stays for the rest of its life of usually a few years.

IDENTIFICATION

In South West England there are three really common shore barnacles and each displays features of much interest while conforming to the general pattern of life described above. The species are :

Chthamalus stellatus
Balanus balanoides
Elminius modestus

All three are small and resemble each other superficially. Close examination shows detailed differences. The wall of plates which encloses the animal consists, in *Elminius*, of four separate pieces whereas in the other two there are six plates (Fig. 2). In the case of *Chthamalus* the plates at the two ends of the slit-like opening are overlapped by the lateral plates ; whereas in *Balanus* the carina is overlapped by the lateral plates but the rostrum overlaps the laterals. In addition the opening of the shell is kite shaped in *Chthamalus* and diamond shaped in *Balanus* and *Elminius* (that is to say the widest part is near one end in *Chthamalus* and near the middle in *Balanus*).

CROWDING

Curious features of barnacle growth must be mentioned here rather than later as they affect the description given above. When growing in places where plenty of space is available barnacles are usually broad based, conical in shape, and display clearly the characters of their own species. But when growing in closely crowded conditions species react differently. Some individuals retain their characteristic appearance and crowd others out to make room for their own development. *Elminius* doesn't change much in crowded conditions. But *Balanus* and *Chthamalus* do. Instead of growing as a cone on a broad base, they have room for only a very small base and grow up into a tall cylindrical shape, sometimes

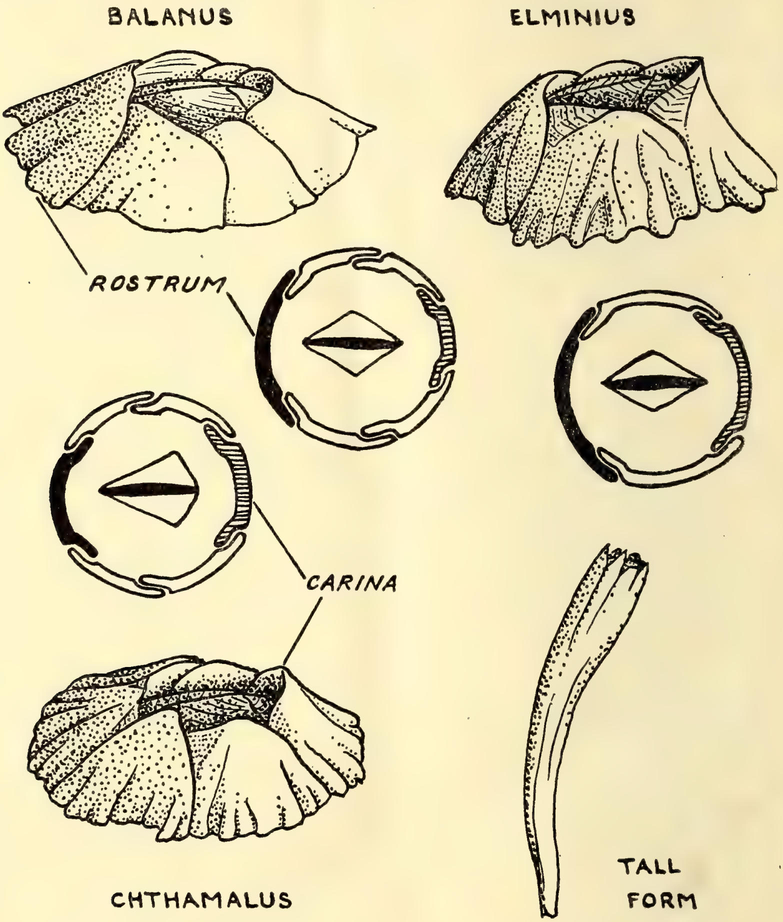

FIG. 2. The three common British barnacles in oblique side view with diagrams illustrating the number and arrangement of the wall plates and the shape of the opercular opening. The tall form may occur in *Balanus* or *Chthamalus*.

even expanding so that the upper part is wider than the base. The height may exceed the diameter five or even ten fold, whereas usually the diameter is greater than the height. Another feature of barnacle growth is that the shells may become corroded and rough so that the individual plates are difficult to make out. This often happens with crowded specimens and the two peculiarities make identification difficult.

DISTRIBUTION

The three common species are surprisingly different in their world distribution. The British marine fauna is peculiar insofar as it consists to a large extent of animals from northern latitudes which extend southwards to Britain, of animals from more southerly latitudes which extend northwards to Britain and only to a small extent of animals which are really at home in these temperate regions. Fortunately from the point of view of interest, our three common barnacles belong one in each category and this is displayed quite clearly in their breeding and feeding habits (see below).

Chthamalus stellatus is a warm water species extending from the Mediterranean northwards to occupy all coasts of Ireland but only the west coasts of Great Britain. Here it extends from just west of the Isle of Wight westward to the Lizard and so north to the north coast of Scotland. Here it dies out on the north east tip of Great Britain so that the east coast and the eastern end of the English Channel is free of this species. This distribution is apparently produced by the winter temperature conditions (the winter isotherms run north and south) and seems to be due to the failure of the very young barnacles to survive the east coast winter temperatures, since the adults have been shown experimentally to be able to do so.

In contra-distinction to *Chthamalus*, *Balanus balanoides* is a north Atlantic arctic or sub-arctic species which extends southwards to the French coast and is found on all coasts of the British Isles.

Elminius modestus is a temperate species and is very much at home in British waters but its history is surprising. Until 1943 it was known only from Australia and New Zealand. During the war it must have arrived alive on ships from the southern hemisphere and the larvæ must have settled on the shores near ports. It was definitely discovered in 1946 at Chichester, but collections made in 1943 near the Isle of Wight also contained *Elminius*. By 1948 it occupied English coasts from Norfolk to Dorset ; in 1950 it occupied the whole of the English and Welsh coasts. In 1955 it crossed into

Scotland and in 1957 to Ireland. It was first recorded in the Bristol Channel at Blue Anchor in January 1948 and is now common.

BREEDING

As might be expected of a warm water species *Chthamalus* finds conditions congenial in summer time and breeds from April or May to September. The cyprids begin to settle in September and continue to do so into the winter. The very young barnacles are thus exposed immediately to winter conditions and it is presumably this that restricts the species to our warmer western coasts.

Balanus balanoides, as befits a northern species, breeds in the winter period. Mating takes place in November and the eggs are present in the shell cavity during the winter. The nauplii emerge in February and March and the cyprids settle in April.

Elminius breeds all the year round. It is a prolific breeder and may have 12 broods in the year. However it breeds more rapidly in summer than in winter and successful settlement seems to take place mainly in the summer. Despite the large number of broods *Elminius* does not necessarily produce more larvæ annually than other species. It is a small barnacle and produces about 500 eggs per brood. A large *Balanus balanoides*, although producing only one brood per annum, may lay 10,000 eggs.

FEEDING RHYTHM

The extensive breeding season of *Elminius* shows its suitability for British Waters and gives some indication of the cause of its rapid spread. But additional evidence on this point has been gained from studies of the feeding rhythm. Intertidal barnacles normally comb the water for food by a rapid rhythmic sweep of their appendages. If these sweeps are timed while the individuals are subjected to water of different temperatures it becomes apparent firstly that *Elminius* has a much more rapid beat, and secondly that it has a wider temperature tolerance than other (British) species. Thus it continues to beat at high temperatures after the cold water *Balanus* has stopped and at low temperatures after the warm water *Chthamalus* has stopped. It is not so well adapted to cold as *Balanus* nor to heat as *Chthamalus* but it has a wider temperature range than either, a wider optimum range and a more rapid maximum rate of beat. It will be interesting to see how far north and south the immigrant *Elminius* will eventually spread although present indications suggest that its rate of spread is slowing down.

Erratum : printer's omission

ZONATION

Although all three species are found between tide marks there is a substantial difference in the tide level at which they are found. All species of *Chthamalus* are found high in the tide zone and our own species although sometimes found below mid-tide level is most abundant near high water mark of neap tides but also extends above this level and even into the splash zone above normal high tide levels. *Balanus balanoides* is found lower on the shore and usually attains its maximum abundance about mid-tide level. It

continued top page 387

normally extends well above this level and may also be found right down to low water mark or even into the sub-littoral. In the northern part of its distribution, in arctic regions, the species has been recorded 30 metres below low water. *Elminius*, where common, attains its maximum abundance below mid-tide level but can be found in smaller numbers high up with *Chthamalus* and extends downwards into the sub-littoral where it is becoming common mixed with our British sub-littoral species, such as *Balanus crenatus*.

GROWTH RATES AND DURATION OF LIFE

Generally speaking barnacles seem to live for a few years and achieve most of their growth within 12 months of settlement. Breeding begins when they have achieved some two-thirds or three-quarters of the size normal to the species and so they often breed in the first breeding season after settlement. The main growing season is the summer and little growth takes place in the winter. This is probably not a temperature effect but is due to the relative abundance of food. *Chthamalus* apparently lives for several years and *Elminius* for only one or two years. *Elminius* may, in a good summer, attain breeding size in 8 or 10 weeks. In the case of *Balanus balanoides* the tide level at which it settles has a marked effect on growth rate and breeding. Below mid-tide level the cyprids which settle in April will reach a small adult size by November and will then breed and die. Just above mid-tide level not many will grow so fast as that (they are not submerged for so long at each tide and feeding time is therefore reduced) and most of them will continue growing in their second year and breed in the second season. But these will usually live on to breed a second time—and sometimes a third. Higher still growth will be somewhat slower and breeding may be delayed until the third season. But these will live on to breed three or more times, attaining an age of five or more years, and a larger size than individuals lower down on the shore. It may also be mentioned that as their size increases so does their productivity and a *Balanus* in its first breeding may produce a few thousand eggs but later may attain (exceptionally) to 13,000 eggs.

EXPOSURE

Although the three species have been shown to zone at three different levels on the shore it is not on all barnacle covered shores that all three species occur. From what has been said above it is clear that the east coast of Scotland has only one species (*Balanus*), the east coast of England has *Balanus* and *Elminius*, the west coast of Scotland and the Irish coasts have *Balanus* and *Chthamalus*, and the west coasts of England and the coasts of Wales have all three species.

But this is speaking in general geographical terms. If the coasts of England and Wales, where all three species are known to occur, are examined in detail it quickly becomes apparent that open, wave-washed coasts do not support *Elminius*, that sheltered coasts do not support *Chthamalus*, and that *Balanus* may be less abundant than either in extreme conditions but more abundant than either in intermediate conditions. Good examples of these effects have often been recorded but local examples have been defined by Bristol University students working in the Bristol Channel and at the Dale Fort Field Centre in Pembrokeshire.

Working in 1956, Mr. D. M. Beard showed that on the exposed coasts at Morte Point near Ilfracombe *Chthamalus* occurred at the rate of 130 per square inch and that the numbers gradually declined along the Bristol Channel until they died out completely at Weston. *Elminius*, on the other hand, was absent from Ilfracombe but appeared a few miles up the Channel at Heddon's Mouth. Then, from an abundance of only 2 per square inch it increased by Weston to 180 and was still present at Aust at the rate of 30 per square inch. This illustrates clearly the intolerance of *Chthamalus* for estuarine conditions of shelter, mud and reduced salinities, and the favourableness of these factors for *Elminius*.

Balanus used to be common in the lower reaches of the Channel but is no longer so and only occasional individuals have been recorded between Heddon's Mouth and Clevedon. This may be due to long term changes in the *Balanus* population since it is known that the species nearly died out in the Plymouth area in 1949–50. Thus no data are available from the Bristol Channel on the effect of shelter on this species. However, counts by classes of students during field courses at Dale Fort illustrate the effect of shelter quite clearly.

The Pembroke coast from Skomer Island to Milford Haven is very much exposed and wave washed but the Dale Peninsula although similarly exposed on one side from West Dale Bay to St. Ann's Head, has a partly sheltered coast from St. Ann's head to Dale Point (where each of the three main bays has an exposed and a sheltered side), and a very sheltered coastline from Dale Point to the Gann Flats. Counts of barnacles were made down the shore at selected places from high tide level to low tide level and some of the results are presented in Fig. 3.

A section on the mainland opposite Skomer Island, examined in 1955, illustrates the 'normal' distribution of *Balanus* and

Chthamalus on a fairly exposed coast (A, Fig. 3). Here we see *Chthamalus* extending four metres above mid tide level but with its greatest abundance of six or seven hundred per 100 square cms. in the region of 1 to 2 metres above. *Balanus*, on the other hand, occupies a zone from 2 metres below to 1½ metres above M.T.L. with a similar maximum abundance to that of *Chthamalus* but at a level from 0.7 below to 0.3 metres above M.T.L.

Taking now a section on the exposed side of Dale Point, at the outer edge of Castle Beach Bay (B, Fig. 3) we find *Chthamalus* rather similarly distributed but *Balanus* is more abundant than near Skomer and extends much lower. In Section A no *Elminius* were found, at Castle Beach Bay two individuals were found but it is obvious that these exposed conditions are not suited to *Elminius*. In 1956 and 1957 the main distribution at Castle Beach Bay was confirmed although a few isolated individuals of both species were found as high as 3½ metres above M.T.L. and no *Elminius* were seen.

Very exposed sites at West Dale Bay were only examined in 1956 and 1957 and similar results were obtained. It was noted, however, that a few *Elminius* did occur in West Dale—but on the sheltered side of large boulders, not on the open faces where counts were made.

Interesting counts were made in Watwick Bay (on the partly sheltered coast) and it was found that in 1956 the exposed side of the bay (C, Fig. 3) gave counts and relative distributions of the two species similar to those of the exposed localities described above, while on the sheltered (west) side in both 1955 and 1956 (D & E, Fig. 3), *Chthamalus* was very sparse and *Balanus* occupied most of the shore including the levels that elsewhere would be occupied by *Chthamalus*. *Elminius* was absent from both places except for two or three individuals on the exposed side at M.T.L.

Turning now to the sheltered side of Dale Point an interesting series of observations were made just inside the Point, and at Brig Stones, and Black Rocks near Dale Village.

In 1955, '56 and '57, just inside Dale Point the conditions were intermediate between the exposed and sheltered sides of Watwick Bay. That is, *Balanus* was abundant and extensive, *Chthamalus* was fairly well represented at its proper level and *Elminius* was very sparse (F, Fig. 3). In 1957, a station was examined just a little further inside the Bay (below the inner end of the Fort) and here, despite its proximity to the other station, *Chthamalus* was much less abundant and *Elminius* was much more abundant (G, Fig. 3).

Examination of the Brig Stones in 1955, 1956 and 1957 showed that *Chthamalus* had practically disappeared, and had been replaced at the high levels by *Balanus*. *Elminius*, on the other hand, was

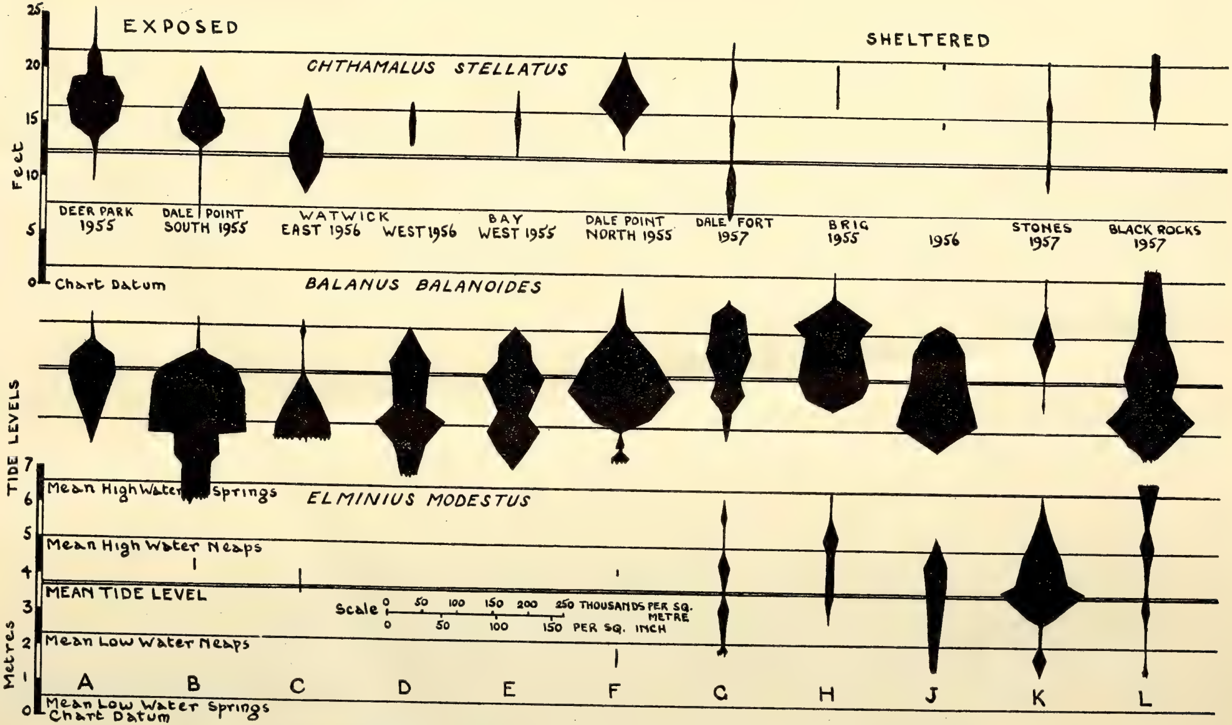

FIG. 3. Diagrams illustrating the abundance and tidal distribution of barnacles near Dale Fort, Pembrokeshire (from data collected at Easter by Bristol University students).

becoming common and in fact showed an increasing abundance during the three year period (H, J & K, Fig. 3).

At Black Rocks, examined in 1956 and 1957, *Balanus* was still the most abundant species, *Chthamalus* was absent in 1956 but present in 1957 and *Elminius* was not quite so common as at Brig Stones (L, Fig. 3).

The general picture of barnacle distribution at Dale in the years 1955 to 1957 is illustrated in Fig. 3 and shows the following main features :

(1) Most shores around Dale are exposed and have a barnacle distribution as in A, B and C, Fig. 3, that is, with abundant *Chthamalus* at about high water of neap tides and with *Balanus* in equal or greater abundance at and below mid tide level.

(2) *Chthamalus* diminishes in sheltered water but may persist in very small numbers—compare A, B and C which are exposed, and F which is only just inside Dale Point, with all the other sections.

(3) *Elminius* is not found on exposed shores (except behind boulders) but appears in sheltered waters (compare A to F with G to L). The absence of *Elminius* from the sheltered side of Watwick Bay is a little surprising but they may appear there in the future as the species is still increasing in the area (compare H, J and K which show the abundance at Brig Stones in three successive years).

(4) The zonation of *Balanus* shows a gradual rise in level from exposed to sheltered water. This seems to be due to an invasion of the upper zone as *Chthamalus* disappears and to the raising of the lower limits because of erosion by gravel and boulders at the lower tide levels.

(5) *Balanus* was equally abundant on exposed shores in the three years from 1955 to 1957 but in Dale Bay there was a sharp drop in numbers between 1956 and 1957 (compare K with H and J : and also F and G).

The 1958 results, recently to hand, are based on four counts made by the 1958 Easter Class on the sheltered shores of Dale Bay between Dale Point and Brig Stones, and they suggest that *Balanus balanoides* was still reduced in numbers as in 1957, and that the distribution of *Chthamalus* was unchanged. The station at Brig Stones was not examined but a little distance away on Point Wood Beach *Elminius* was not so abundant as at Brig Stones in 1957, and its numbers below Dale Fort were unchanged.

OTHER SPECIES

There are other, rarer, species of barnacle to be found on British shores. Of these *Balanus perforatus* is a large conical (volcano like) species with dark purple ribs which occurs only in the south west of Great Britain. It is a warm water species and breeds in summer.

Balanus improvisus is a species characteristically growing in estuaries and it can tolerate even fresh water. It does not occur at Dale but in the Bristol Channel it extends near low water mark from Blue Anchor to Sharpness. Its abundance is variable and it is only common in some years and in some places—usually in the Burnham to Portishead area.

Another species of *Balanus* (*B. crenatus*) is very common below low tide mark but does occur on the shore near low water.

Usually, however, any barnacle above low water of ordinary tides is one of the three described.

THE LOWER LIAS SECTION AT CANNARD'S GRAVE, SHEPTON MALLET, SOMERSET

By D. T. Donovan

THE section in the cutting of the Somerset and Dorset Joint Railway, about 1 mile south of Shepton Mallet (Charlton Road) Station, was published by Woodward (1893, p. 86). The writer recently visited the cutting in order to measure a detailed lithological section. He is indebted to Mr. W. A. Dowden for his help.

THE SECTION

The section newly measured lies on the east side of the cutting, south of the two bridges across the line which lie east of the Cannard's Grave Inn. It is shown diagrammatically in Fig. 1.

The Langport Beds or White Lias at the base are seen to a thickness of 7 feet 6 inches, and consist of shales alternating with marly and compact limestones. The typical White Lias lithology is hardly developed. At the top is a ten-inch bed of pale, grey marly limestone penetrated by U-shaped burrows, similar to those found in the ' Sun Bed ' at the top of the White Lias at various places in North Somerset.

The Blue Lias commences with thin limestones and shales containing the usual bivalve fauna of the ' pre-Planorbis Beds '. A fragment of *Psiloceras* (*Caloceras*) of early Johnstoni Subzone aspect was found 5 feet 3 inches above the base, and *Psiloceras* (*Caloceras*) *belcheri* (Buckman *ex* Simpson) at just above 8 feet. In north-west Germany this species occurs in beds with *Waehneroceras*[1] (*portlocki* horizon of Spath, 1942).

Alsatites liasicus (d'Orbigny), indicating Laqueus Subzone in Spath's scheme, was represented by loose fragments but was not found in place. An indeterminate *Schlotheimia*, indicating Angulata Subzone, was found 15 feet above the base. *Schlotheimia* aff. *similis* Spath, found just above and below the 17 foot level, indicates

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[1] Lange, 1931, p. 352 ; Hoffman, 1949, p. 114 ; recorded as *C. torus* (d'Orbigny). The publication of Lange's monograph on Psiloceratinae (1941) showed that the species known to north German authors as *C. torus* is identical with *C. belcheri*.

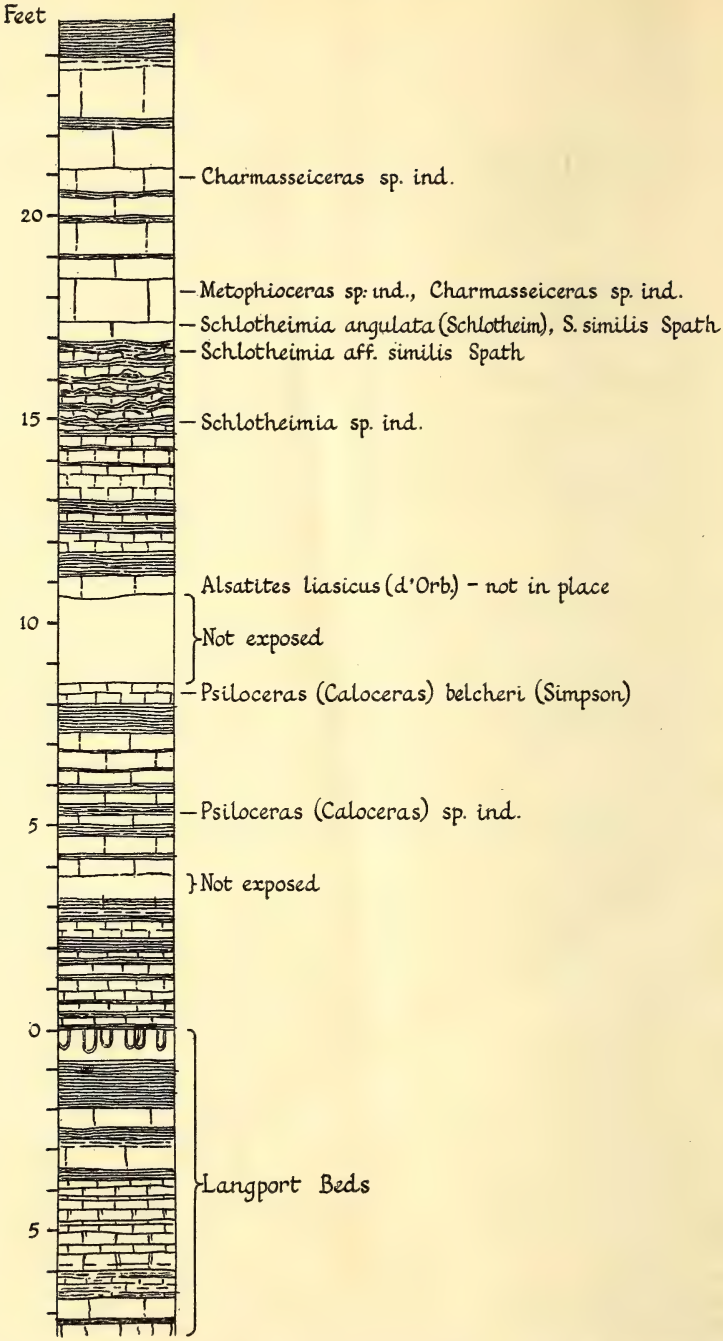
Feet
— Charmasseiceras sp. ind.
20
— Metophioceras sp. ind., Charmasseiceras sp. ind.
— Schlotheimia angulata (Schlotheim), S. similis Spath
— Schlotheimia aff. similis Spath
15
— Schlotheimia sp. ind.
Alsatites liasicus (d'Orb.) - not in place
10
Not exposed
— Psiloceras (Caloceras) belcheri (Simpson)
5
— Psiloceras (Caloceras) sp. ind.
Not exposed
0
Langport Beds
5

FIG. 1. Section through the upper part of the Langport Beds and the Blue Lias in railway cutting east of Cannard's Grave Inn, Shepton Mallet. Scale: 5 feet to 1 inch. A scale of feet is marked on the left-hand side of the section, and numbered upwards and downwards from zero at the base of the Blue Lias.

the upper part of the Angulata Subzone, the top of which is marked by the appearance of *Coroniceras* (*Metophioceras*) at 18 feet.

At 17 feet the lithology changes abruptly from thin-bedded and nodular limestones and shales to massive limestones with very little shale. *Coroniceras* (*Metophioceras*) near the base of these limestones indicates the Conybeari Subzone, the basal subzone of the Bucklandi Zone. The only other ammonite found in these beds was the Schlotheimid *Charmasseiceras*, affording insufficient evidence as to whether the massive limestones all belong to the Bucklandi Zone, or whether the Semicostatum Zone is represented as well. *Gryphæa incurva* (J. Sowerby) is common in the massive limestones, and in the lowest few inches (about 17 foot level) there are simple corals. The limestones are full of fragments of shells and echinoderms. They are capped by an eighteen-inch bed with a fissile top, and succeeded by clays which are ill-exposed.

Woodward (1893, p. 86) gives a thickness of 32 feet 9 inches for the Blue Lias, compared with 24 feet obtained by the writer. The difference lies in the thickness given for the thin-bedded limestones and shales of the Angulata and Planorbis Zones. It is possible that Woodward measured his section in a different part of the cutting, now obscured, and that the thickness of the series is variable.

The clay succeeding the Blue Lias Limestones, recorded by Woodward to a thickness of 30 feet, is not well exposed above the main section. Fossils may still be obtained from it on a slope a little further north, immediately south of the more southerly of the two bridges. The following list of ammonites is based on recent collecting and on specimens in the Geological Survey Museum :

Bifericeras bifer (Quenstedt) (G.S.M. no. 47091).
B. nudicosta (Quen.). (G.S.M. no. 47094).
B. parvum S. S. Buckman (holotype, G.S.M. no. 47093).
B. cf. *quadricosta* (Quen.) (G.S.M. no. 2896 HBW).
B. wrighti Bovier (G.S.M. no. 23598, identified by the late Dr. L. F. Spath).
Eoderoceras (?) sp. cf. *E. anguiforme* (Buckman *ex* Simpson).
E. sp. ind.
Gemmellaroceras sp.
Oxynoticeras oxynotum (Quen.) (G.S.M. 2900 HBW, Zd3148).
Palæoechioceras aff. *spirale* (Trueman & Williams).
P. new spp.
Paracymbites sp. ind.

The fossils were all loose on the surface and no succession could be obtained. *Oxynoticeras* and *Bifericeras* indicate the Bifer (or Oxynotum *s.s.*) Subzone of the Oxynotum Zone. *Palæoechioceras* occurs near the boundary between the Oxynotum and Raricostatum Zones ; it is recorded *in situ* only from the Stowell Park

Borehole (Spath, 1956, p. 151 : as *Hypechioceras* gen. nov.) *Gemmellaroceras* first appears, in Yorkshire, in the Macdonnelli Subzone of the Raricostatum Zone.

Woodward (*loc. cit.*) records about six feet of " dark bluish-grey mottled limestone (full of Belemnites), pale marly beds, earthy and iron-shot limestone and clay " above the clays with ammonites. He places these beds in the Oxynotum Zone, but in view of the fauna now recorded from the clays, the succeeding limestones are unlikely to be earlier than the Raricostatum Zone.

There is little doubt, in view of Woodward's account written when the sections were fresher, that the Turneri and Obtusum Zones of the Sinemurian are unrepresented. The succession may be summarised as follows :

Lithology	*Zones*	*Thickness*
Limestone, marl & clay	?	6 ft.
Blue clay with bands of grey, earthy limestone.	?Raricostatum Oxynotum	30 ft. approx.
(non-sequence)	Obtusum Turneri	—
Blue Lias limestones and shales	?Semicostatum Bucklandi Angulata Planorbis	24 ft. (up to 32 ft. 9 ins. according to Woodward)
White Lias	—	7 ft. 6 ins. seen.

CONCLUSIONS

The Lower Lias shows rapid lateral variations at Shepton Mallet. About 500 yards north of the section recorded, about twelve feet of massive limestones, in beds up to one foot thick with very little shale, are exposed. Fragments were seen of *Coroniceras* of types indicating the Bucklandi and the early Semicostatum Zones. Immediately south of Charlton Road Station the old quarries still show more or less inaccessible faces. Woodward (1893, p. 87) said that the total thickness of the stone beds here was 'upwards of 50 feet'.

In the cutting west of the Western Region Station sections have been published by Moore (1867, pp. 505-6), and by Woodward and others (Geol. Surv. Vertical Sections, sheet 46, no. 15), with a summary by Woodward (1893, p. 87). There are discrepancies between these accounts ; that on sheet 46 shows 22 feet of beds above the White Lias, the top of the section lying at an undetermined horizon within the Bucklandi Zone. The thickness, as well as the lithology of the lower zones, is comparable to that at Cannard's Grave, but the massive limestones of the Bucklandi

Zone are not in evidence. The lithological characters of the Blue Lias correspond in general to the normal development north of the Mendips, except that the Saltford Shales, which in the Bristol Avon valley separate a lower and an upper group of limestones, are not in evidence. Southwards from the Avon valley the Saltford Shales become rapidly reduced in thickness (Donovan, 1956, pp. 185, 191, 199). The total thickness of the Blue Lias Limestones at Cannard's Grave is less than half that at Saltford Cutting, estimated at about 64 feet (Donovan, 1956, p. 205).

South-westwards from Shepton Mallet, at Street and in the Polden Hills, the Blue Lias thickens, as shown by sections recorded in the last century and summarised by Woodward (1893, pp. 76-85). Very few sections are now exposed, and it is impossible to determine zonal thicknesses from the old records. At Street about 20 feet of beds appear to lie entirely in the Planorbis Zone (Woodward, p. 79), and at Keinton Mandeville there is a similar thickness (p. 77). At Evercreech Kellaway & Wilson attribute 30 feet of blue limestones with shale partings to the Bucklandi Zone, the total thickness of the zone being unknown (1941, p. 141). At Sparkford Hill cutting, north of Queen Camel, Moore (1867, pp. 262-4) recorded 225 feet of (incomplete) Blue Lias, in predominantly argillaceous facies. The top of the section is not dated as no fossils were recorded from the top 108 feet.

The clays with small ammonites of the Oxynotum and Raricostatum Zones were noted in the banks of the Brue at Hornblotton Mill by Woodward (op. cit. pp. 84-5) who recorded *Am. oxynotus*, *Am. trivialis*, and *Am. Birchii*, the latter probably a *Bifericeras*. They were also found in a well sinking at Sutton, about two miles to the north-east (Woodward, p. 85 ; Kellaway and Wilson, 1941, p. 142).

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	Sullivan, L. G.	The Walnuts, 85 Nicholls Lane, Winterbourne, Nr. Bristol
A.	Sutherland, I. H.	Churchill Hall, Stoke Bishop, Bristol, 9.
	Sutton, M.	14 Woodcroft Avenue, Whitehall, Bristol, 5.
C.	Swaine, Miss A. K., F.R.A.S.	Pisang Cottage, Nailsea, Nr. Bristol.
	Swanborough, R. E.	24 Highfield Avenue, Hanham, Bristol.
	Sweet, G.	40 Cornwallis Crescent, Clifton, Bristol, 8.
	Sweet, Mrs. G.	Do.
	Sydenham, W. I. J.	230 Overndale Road, Fishponds, Bristol.
	Tasker, L.	46 Apsley Road, Clifton, Bristol, 8.
	Taylor, Miss A. E.	16 Cotham Road, Bristol, 6.
	Taylor, Mrs. A. M.	1 Northcote Road, Clifton, Bristol, 8.

	Taylor, F. T.	Harbury, Harbury Road, Westbury-on-Trym, Bristol.
	Taylor, S. M., B.Sc., S.I.Mech.E.	Glenalan, Station Road, Nailsea, Nr. Bristol.
	Taylor, Mrs. S. M.	Do.
	Taylor, Mrs. W. N.	46 Islington Road, Bedminster, Bristol, 3.
C.	Terry, Miss D. G.	Beechwood, 52 Rockcliffe Road, Bathwick, Bath, Somerset.
	Tetley, Mrs. H.	4 The Avenue, Sneyd Park, Bristol, 9.
	Thearle, R. F.	47 Elliston Road, Redland, Bristol, 6.
	Thearle, Mrs. R. F.	Do.
	Thornhill, H. A.	Heddon, Church Lane, Farleigh, Backwell, Nr. Bristol.
	Tranter, R. W.	66 Marshfield Road, Fishponds, Bristol.
	Trump, Mrs. A. G.	181 Stoke Lane, Westbury-on-Trym, Bristol.
	Trump, Miss J. M.	Do.
	Turner, Miss E. E. A.	10 Clyde Road, Redland, Bristol, 6.
H.	Turner, H. W., M.A., F.G.S.	The Cottage, Kensington Place, Clifton, Bristol, 8.
A.	Turner, J. S.	Redland Hall, Redland Hill, Bristol, 6.
	Tyrrell-Pitt, Mrs. J.	First Acre, Courtenay Road, Keynsham, Nr. Bristol.
C.	Vallis, J. L. H.	Tor Cottage, Chewton Mendip, Nr. Bath, Somerset.
	Vance, Mrs. R. D.	The Post Office, Nailsea, Nr. Bristol.
	Vanderplank, Miss J. A.	Y.M.C.A. Hostel, 15 Berkeley Square, Clifton, Bristol, 8.
	Vernon, J. D. R., B.Sc.	22 St. David's Road, Thornbury, Nr. Bristol.
	Vernon, W. F.	Wyngarth, Easter Compton, Nr. Bristol.
	Vinnicombe, Miss E. J., B.Sc., M.A.	Denver, 32 Ridgeway, Long Ashton, Nr. Bristol.
	Vowles, D. G.	2 York Avenue, Ashley Down, Bristol, 7.
C.	Vowles, J. H.	11 Stanhope Road, Weston-super-Mare, Somerset.
	Vowles, Miss. P., M.B., Ch.B.	19 Southmead Road, Westbury-on-Trym, Bristol.
A.	Waddicor, M. H.	7 Woodstock Road, Redland, Bristol, 6.
	Wagner, M. A.	Shepperdine House, Thornbury, Nr. Bristol.
	Wakefield, Mrs. G. S.	2 Southward Avenue, Coombe Dingle, Bristol, 9.
	Wakefield, Miss I. D.	42 Westbury Lane, Coombe Dingle, Bristol.
C.	Wallington, W. A.	Bregar, Station Road, Nailsea, Nr. Bristol.
C.	Wallington, Miss J.	Do.
	*Wallis, F. S., D.Sc., Ph.D., F.G.S.	The City Museum, Queen's Road, Bristol, 8.
	Walsh, Mrs. F.	Helvellyn, Dark Lane, Backwell, Nr. Bristol.
	Walters, Miss J.	4 Oakwood Avenue, Henleaze, Bristol.
	Wareham, Miss C. A. L.	Corscombe, Church Lane, Backwell, Nr. Bristol.
	Wareham, Miss F.	Do.
C.	*Warne, L. G. G., M.Sc., Ph.D.	25 Amherst Road, Manchester, 14.
	Watkins, N. A., M.A., F.R.E.S.	9 Druid Road, Stoke Bishop, Bristol, 9.
	Watters, Miss E. D., M.A.	The Little House, Frenchay, Bristol.
	Watters, Miss M. M., M.A.	Do.
C.	Webb, H. F.	Elmside, 43 Old Town, Wotton-under-Edge, Glos.

C.	Weir, Mrs. A. M.	Hursley Hill, Whitchurch, Bristol.
C.	Weir, G. M.	Do.
	Weir, W. D., A.R.I.C.S.	3 Stafford Place, Weston-super-Mare, Som.
	Weir, Mrs. W. D.	Do.
C.	*Welch, F.B.A., B.Sc., Ph.D., F.G.S.	H.M. Geological Survey and Museum, South Kensington, London, S.W.7.
A.	Welch, M. J.	44 Conygre Road, Filton, Bristol.
	Welshman, Miss M. J.	85 Kingsdown Parade, Bristol, 6.
	West, Miss N. L.	18 Dennyview Road, Abbots Leigh, Nr. Bristol.
	Westcott, Miss M. V.	20 Linden Road, Redland, Bristol, 6.
	Whistler, L. D.	8 Dundonald Road, Redland, Bristol, 6.
	White, D. S., B.Sc.	44 The Park, Kingswood, Bristol.
	Whiting, H. P., D.S.C., M.A., Ph.D.	62 Woodstock Road, Redland, Bristol.
	*Whittard, Prof. W. F., D.Sc., Ph.D., F.R.S.	Department of Geology, The University, Bristol, 8.
A.	Wilcox, M. J.	79 Manor Road, Fishponds, Bristol.
	Williams, Miss E. I.	67 White Cross Avenue, Knowle, Bristol, 4.
	Williams, Mrs. G. E.	2 Belmont, de Maulley Road, Canford Cliffs, Bournemouth, Hants.
	*Willis, A. J., B.Sc., Ph.D.	Department of Botany, The University, Bristol, 8.
	Wills, R. F.	40 Claremont Road, Bishopston, Bristol, 7.
	Wills, Mrs. R. F.	Do.
	Wiltshire, Miss M. O. P., D.Sc.	Clifton Hill House, Clifton, Bristol, 8.
	Winterbottom, J., B.Sc., A.M.I.E.E.	6 Parkside Avenue, Winterbourne, Nr. Bristol.
C.	Withers, Miss D.	21 Upper Oldfield Park, Bath, Somerset.
H.	*Womersley, H., A.L.S., F.R.E.S.	Museum, North Terrace, Adelaide, South Australia.
	Wood, L.	86 Brynland Avenue, Bishopston, Bristol, 7.
C.	Woodland, P., M.A.	Rednock, Dursley, Glos.
C.	Workman, D. R.	14 The Croft, Trowbridge, Wilts.
	Wraight, G. V., N.D.D.	288 Canford Lane, Westbury-on-Trym, Bristol.
	Wraight, Mrs. G. V.	Do.
	Wright, M. A.	Woodside, 28 Glebe Road, Long Ashton, Nr. Bristol.
	Yemm, Prof. E. W., B.A., D. Phil.	Stoneleigh, Long Ashton, Nr. Bristol.
	Yemm, Mrs. E. W., B.A.	Do.
**H.*	Yonge, Prof. C. M., C.B.E., D.Sc., F.R.S., F.R.S.E.	The University, Glasgow.
	Young, K. B.	12 Clifford Gardens, Shirehampton, Bristol.
	Young, Mrs. J.	Do.

AFFILIATED SOCIETIES

BATH—

Bath Natural History Society (Hon. Secretary Mr. Radford), 3 Charlcombe Rise, Bath, Somerset.

City of Bath Training College, Newton Park, Newton St. Loe, Nr. Bath, Som.

BRISTOL—

Bedminster Down Secondary School, Donald Road, Bristol, 3.

Bristol, Clifton and West of England Zoological Society, Clifton, Bristol, 8.

Bristol Grammar School Field Club, Elton Road, Bristol, 8.

British Broadcasting Corporation (Natural History Unit), Broadcasting House, Whiteladies Road, Bristol, 8.

Clifton High School Field Club, College Road, Bristol, 8.

College of St. Matthias, Fishponds, Bristol.

Duncan House School Scientific Society, The Promenade, Clifton, Bristol, 8.

Geological Society, The University, Bristol, 8.

Portway Secondary Boys School Field Club, Shirehampton, Bristol.

Queen Elizabeth's Hospital Naturalists' Society, Berkeley Place, Clifton, Bristol, 8.

Red Maids Scientific Society, Westbury-on-Trym, Bristol.

Redland High School, Redland Court, Bristol, 6.

St. Ursula's High School Field Club, Brecon Road, Westbury-on-Trym, Bristol.

Social Club (Natural Science Section), Imperial Chemical Industries Limited, Trafalgar, The Promenade, Clifton Down, Bristol, 8.

University Horticultural Science Laboratories, Bracken Hill, Leigh Woods, Bristol, 8.

Botanical and Zoological Societies, The University, Bristol, 8.

DURSLEY—

Dursley & District Bird Watching and Preservation Society (Hon. Secretary T. P. Walsh), 76 Kingshill Road, Dursley, Glos.

Dursley Grammar School Natural History Society, Dursley, Glos.

FALFIELD—

H. M. Prison Scientific Group, Falfield, Glos.

KINGSWOOD—

Kingswood Grammar School Natural History Society, Hanham Road, Kingswood, Nr. Bristol.

LEYHILL—

Birdwatching Goup, Leyhill, Glos.

REPORT OF COUNCIL
1958

THE Membership of the Society at the end of the year was 630, with 20 Affiliated Societies. This is a very encouraging increase.

At the Annual General Meeting in January the Officers and Members of Council were duly elected. Miss M. H. Rogers was elected President in succession to Mr. R. Bassindale. At the Annual Dinner over 100 members and friends were present and it was a most successful evening. The guest speaker was Mr. J. H. Barrett, Warden of Dale Fort Field Centre. The usual General and Sectional Meetings were held throughout the year.

A. C. LEACH, *Hon. Secretary.*

REPORT OF ENTOMOLOGICAL SECTION
1958

AT the 94th Annual Business Meeting held on Tuesday, January 7, 1958 Mr. Norman A. Watkins was elected President and Mr. Cecil L. Bell Secretary.

There were five indoor meetings during the year as follows :—

Feb. 4 : Films—*The Sawfly and Looper Caterpillars.*
Mar. 4 : Films—*The Three Wicked Sisters. Spiders.*
Oct. 7 : Films—*White Flies and Tomatoes. Meadow Ants.*
Nov. 4 : Films—*Bees within the Hive. The " Ruthless One."* (A Shell Film). Sound Recordings made by the Secretary of the following : (1) Several caterpillars eating. (2) A privet Hawk Caterpillar eating. (3) The curious hissing sound of the Peacock Butterfly opening and closing its wings.
Dec. 2 : Visit to the City Museum. By kind invitation of the Director, Dr. F. S. Wallis.

On Saturday, June 7, the Section held a Field Meeting at Waterley Bottom, Glos.

CECIL L. BELL, *Hon. Secretary.*

The Hon. Treasurer in Account with the Bristol Naturalists' Society

RECEIPTS AND PAYMENTS FOR THE YEAR ENDED 31 DECEMBER, 1958

Dr.

1957 £ s. d.			£ s. d.	£ s. d.	£ s. d.
	To Members' Subscriptions :—				
15 0 0	Life				
	Full Members	1957	7 0 0		
		1958	308 18 0		
		1959	17 10 0		
293 19 6				333 8 0	
	,, ,, of the same household	1957	– – –		
		1958	30 15 0		
		1959	2 0 0		
30 0 0				32 15 0	
	Country Members	1957	1 0 0		
		1958	38 2 6		
		1959	1 0 0		
40 11 6				40 2 6	
	Associates (" Old ")	1958	1 9 6		
2 3 0				1 9 6	
	Associates	1957	– – –		
		1958	5 15 6		
7 10 0				5 15 6	
	Affiliated Societies	1957	2 0 0		
		1958	20 5 0		
		1959	5 1 0		
22 5 0				27 6 0	
	Junior Section	1958	23 17 6		
26 10 0		1959	2 5 0		
				26 2 6	
					466 19 0
437 19 0					
2 13 0	,, Profit on Dinner				1 15 4
3 8 6	,, Proceedings (1956 covers etc.)			55 3 3	
187 4 4	do. (1957 do.)			14 16 7	
5 15 0	do. (1957 Subscriptions)			4 0 0	
3 11 6	,, Publications			15 0	
1 12 6	,, Avon Gorge reprint			10 0	
– – –	,, Bird List reprint			10 0	
7 10 0	,, Advertisements			– – –	
					75 14 10
10 3 6	,, Field Committee Surplus over expenses				5 4 0
11 11 7	,, Interest on Deposit (Post Office)				8 19 10
671 8 11					558 13 0
	,, Balances :				
	Bank			91 2 9	
	Post Office Savings Bank			237 18 1	
	In hands of Secretaries			3 8 7	
355 13 11	,, ,, of Field Committee			20 2 6	
					352 11 11
£1,027 2 10					£911 4 11

Cr.

1957 £ s. d.		£ s. d.	£ s. d.
	By Subscriptions :—		
	Ray Society	1 1 0	
	S.W. Naturalists Union	3 0 0	
	Mammal Society	1 1 0	
	Council for Nature	1 0 0	
	Steep Holm	9 0 0	
11 2 0			15 2 0
436 16 1	,, *Proceedings* (1957)		211 14 7
23 5 6	,, Stationery		15 19 8
40 12 10	,, Printing		97 16 1
	,, Postages, etc. :		
	Hon. Secretary and Assistant	59 12 2	
	Hon Treasurer with	6 12 11	
	Proceedings for Hon. Lib.	2 2 8	
	Hon. Editor	9 10	
67 16 3	Hon. Publicity Secretary	1 0 0	
			69 17 7
1 0	,, Rent (use of Library Room)		1 0
3 15 0	,, Fire Insurance		4 3 2
12 7 6	,, Books and Periodicals		9 11 6
18 0	,, Bank Charges		13 6
7 2 0	,, Fares and Expenses of Meetings		13 13 3
6 2 6	,, Clerical Assistance and Gratuity		6 5 0
4 12 3	,, Bookbinding		16 7 9
	,, Grants : Botanical	15 0 0	
	Entomological	10 0 0	
	Geological	15 0 0	
	Ornithological	20 0 0	
60 0 0	Junior Section	5 0 0	
			65 0 0
674 10 11			
			526 5 1
	,, Bank Balances :		
91 2 9	Bank	151 18 4	
237 18 1	* Deposit in Savings Bank	200 3 4	
20 2 6	In hands of Field Committee	25 6 6	
3 8 7	Assistant Secretary	7 11 8	
			384 19 10
£1,027 2 10			£911 4 11

* Including Bookbinding Account, £65 1s. 2d.

REPORT OF BOTANICAL SECTION

1958

AT the Annual Business Meeting held on January 13 Mr. Ivor W. Evans was re-elected President and Mr. R. F. Wills, Hon. Secretary. Committee members elected were Mrs. G. S. Wakefield, Miss A. M. Sampson, Dr. A. F. Devonshire, Mr. J. A. Eatough, Mr. F. W. Evens, and Mr. H. F. Howard.

During the year Dr. A. F. Devonshire continued with the scheme for mapping the British Flora organised by the Botanical Society of the British Isles and reports the following results at the end of the year. Square 31/56, 403 species; square 31/57, 596 species; and square 31/66, 480 species. In addition square 31/46 was jointly taken over with Commander Roe of the Bath Naturalists' Society and the number of records raised from 191 to 461. The majority of the new records were made by Commander Roe.

Once again the Wild Plant Table at the Bristol Museum has been much appreciated and our sincere thanks go to Dr. F. S. Wallis and Mr. P. Bird of the Museum and to Mrs. G. S. Wakefield and Mr. F. W. Evens and to all our members who have contributed specimens.

On Saturday, July 12, there was a whole day excursion by coach to Braunton Burrows near Barnstaple under the leadership of Dr. A. J. Willis of the Botany Department, Bristol University. The Burrows is a sand dune system 3¼ miles long by 1 mile wide and is famous for its rich flora and fauna. Despite the bad weather a most interesting and instructive day was enjoyed by 40 members.

During the year the following Winter Meetings were held :

Jan. 13 : Annual Business Meeting. Shrubs for scent and colour. Mr. Eric Hobbis.
Feb. 10 : The Work of the Field Studies' Council. Mr. J. H. P. Sankey, Warden of Juniper Hall, Surrey.
Mar. 17 : " Mycetozoa or Creepies " and their Ways. Mr. F. W. Evens.
Oct. 13 : Members' Evening. Short Papers and colour transparencies.
Nov. 10 : Wind as a Factor affecting Plant Growth. Dr. F. H. Whitehead.
Dec. 12 : Flowers of the Isles of Scilly. Mr. J. E. Lousley.

The following field excursions took place during the Spring and Summer under the leadership of those named.

May 3 : Brean Down. Miss C. Groves.
May 7 : Long Ashton Research Station. Mr. G. E. Clothier.
May 19 : Flax Bourton. Miss A. M. Sampson.
June 7 : Wotton-under-Edge. Mr. E. P. Bury and Mr. H. F. Webb.
June 18 : Knowle Hill and Chew Magna. Dr. A. F. Devonshire.
June 30 : Brislington to Keynsham. Mr. I. W. Evans.
July 12 : Braunton Burrows. Dr. A. J. Willis.
July 16 : Pill to St. George's Wharf. Mr. P. J. M. Nethercott.
July 26 : Blackdown. Mr. V. D. Dennison and Mr. R. F. Wills.
Aug. 18 : Lamplighters to Avonmouth. Mrs. G. S. Wakefield.
Aug. 23 : Bitton and Upton Cheyney. Mr. I. W. Evans.
Sept. 20 : Kilcott. Mr. G. W. Garlick.
Oct. 11 : Limpley Stoke. Mr. J. A. Eatough.

During the Summer months five indoor meetings were held to which members brought specimens for identification.

R. F. WILLS, *Hon. Secretary.*

REPORT OF GEOLOGICAL SECTION 1958

AT the Annual Business Meeting held in the Geology Department of the University on January 15, 1959, the following officers were elected :—President, Mr. C. E. Leese ; Vice-President, Mr. F. S. Ross ; Hon. Secretary, Mr. R. G. Payne ; Field Secretary, Mr. V. D. Dennison ; *Ex-Officio*, Professor W. F. Whittard and President of Students' Geological Society; Committee, Mr. H. W. Turner, Dr. S. Simpson, Mr. T. R. Fry, Mrs. G. S. Wakefield, Dr. M. L. K. Curtis, Mr. A. C. K. Fear, Mr. W. F. Vernon, Miss L. Carlton, Dr. F. C. Phillips, Mr. R. Bradshaw, Dr. R. J. G. Savage.

During 1958 the committee met twice, on January 17 to make proposals for officers, and on February 7 to arrange summer and winter programmes. The Annual General Meeting was held on January 21 when reports were read and officers elected. Mr. C. E. Leese replaced Mr. F. S. Ross as Chairman. The Annual General Meeting was followed by a programme of geological films.

The exhibition meeting was held in March in the Geology Department when four members exhibited geological material. In October Dr. Savage and Mr. M. E. White gave a demonstration of fossil preparation which was well attended and enthusiastically received. There were two lecture meetings during the year : in February Prof. R. F. Peel lectured on "Ruwenzori" and in November Dr. G. P. L. Walker of Imperial College, London, lectured on the geology of Iceland. Both these meetings had a good attendance.

In August a special lecture meeting was arranged to welcome back to Bristol Dr. I. S. Loupekine on leave from Nairobi. Dr. Loupekine talked about his expedition to Mount Kenya and illustrated it very fully with colour transparencies. Members found this an interesting and exciting evening.

There were five Field Meetings during the Summer as follows :—

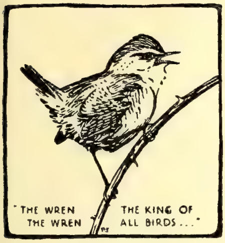
April	Merehead and Holwell Quarries : leader Mr. T. R. Fry.
May	Meldon Quarry, Devon ; leader Dr. F. C. Phillips.
July	Vale of Pewsey ; leader Dr. D. T. Donovan.
July	Joint Meeting with Botanical Section to Blagdon and Churchill.
September	Winford and Dundry ; leader Mr. F. S. Ross.

All indoor meetings were held in the Geology Department, the last two in the new Queen's Building, and the Section puts on record its thanks to Professor Whittard and indebtedness to the University for making the premises freely available for these activities.

R. J. G. SAVAGE, *Hon. Secretary.*

REPORT OF ORNITHOLOGICAL SECTION

1958


"THE WREN THE WREN
THE KING OF ALL BIRDS..."

DURING the year there were 15 additions to the Section's Roll of Members, which now stands at 201. The very poor weather affected attendances at field walks, and was also the probable cause of a fall in the number of B.T.O. Nest Record Cards completed. Only one piece of organised field work was undertaken —a survey during the breeding season of the Shelduck population of the coast from the south of Sand Bay to Sharpness. This work was very well supported, and it is particularly gratifying that several new members contributed effectively to it. The results have thrown much light on the local breeding distribution and breeding success of the species.

At the 34th Annual Business Meeting, on January 22, Mr. G. E. Clothier, Mr. S. M. Taylor, Miss F. Wareham and Mr. R. F. Wills were re-elected President, Hon. Secretary, Assistant Hon. Secretary and Hon. Treasurer respectively. Mr. H. H. Davis and Mr. G. Sweet were elected to the Committee in place of Mrs. M. V. Taylor and Mr. B. King, who retired by seniority. Owing to pressure of other work, Mr. King also resigned from the Editorial Committee, to which Mr. B. K. Brooke was elected in his place, Messrs. Chadwick, Davis, Poulding and Wright being re-elected.

The programme of indoor meetings was as follows :—

Jan. 22 : Annual Business Meeting. Film, *Woodpeckers* by H. Sielmann.
Feb. 21 : Joint Meeting with the Royal Society for the Protection of Birds. Mr. P. E. Brown introduced the film *Birds in Britain*.
Mar. 5 : Summer Field-Programme Meeting. Short talks and recordings of bird songs.
Mar. 28 : Mr. H. H. Davis, " To Livingstone for the Pan-African Congress."
Oct. 10 : Mr. Harry Savory, " The History and Practice of Falconry."
Nov. 7 : Talks on some rarer British Breeding Birds, by members of the Section.
Dec. 3 : Joint Meeting with the British Trust for Ornithology. Dr. B. Campbell, " Birds at Helsinki, 1958."

Attendance at these meetings averaged 98, ranging from 36 (March 5) to 183 (February 21).

The following field walks were held :—

May 12 : Portbury to St. George's Wharf. Messrs. A. C. Leach and G. Bright.
May 17 : Aust to Littleton. Mr. H. H. Davis.
May 22 : Long Ashton Research Station to Belmont Hill. Mr. G. E. Clothier and Col. G. A. Bridge.
June 2 : Backwell Hill. Messrs. G. E. Clothier and S. M. Taylor.

Attendances at these meetings ranged from 26 (May 12) to 4 (June 2—this meeting was abandoned due to persistent heavy rain). Two coach excursions were held : an afternoon visit to the Wildfowl Trust on Feb. 23, and an all-day trip to Dawlish Warren and the Exe Estuary on Sept. 14. These were attended by 28 and 30 members respectively, and both were rated successful.

The ninth annual Fieldwork Report was published in October, under the title of " Fieldwork Review "—the new title denotes an experimental broadening of the contents, with the inclusion of articles describing various aspects of field Ornithology of general or local interest. This represents another stage in our attempts to help those members who have asked for assistance in learning something of the technical aspects of Ornithology.

By the courtesy of the South-Western Naturalists' Union, the Section was able to arrange a showing in Bristol, on Nov. 12, of the remarkable R.S.P.B. film *Highland Birds*.

S. M. TAYLOR, *Hon. Secretary*.

REPORT OF JUNIOR SECTION

1958

AT the Annual Business Meeting held on January 24 in the Physiology Lecture Theatre the Members' Committee was elected as follows :—Michael Edgell (Chairman), Susan Tapp (Secretary), Anita Drummond, Nigel Webb, Stephanie Sweet and Colin Godman. After the business the Heinz Sielmann film *Summer Meadow* was shown.

The following indoor meetings were held :—

Feb. 28 : Dr. R. J. G. Savage gave an illustrated talk on " Dinosaurs."

Mar. 21 : Mr. D. Hammerton gave an illustrated talk on the " Bacteria and Algae in Reservoirs."

Sept. 26 : Colin Godman gave an illustrated talk entitled " Archæology and the Naturalist."

Oct. 25 : An Exhibition Meeting held at the Royal West of England Academy.

Nov. 21 : Mr. P. Bird gave an illustrated talk about the Mendip Caves.

Dec. 12 : A Joint Meeting with the Botanical Section to hear Mr. Lousley give an illustrated talk on "Flowers of the Isles of Scilly."

The following Field Meetings took place :—

Apr. 12 : Aust Cliffs—Leader Mr. F. Stenhouse Ross.

Apr. 20 : Portland Bill—Leader Mr. B. King. The following birds of Special interest were seen :—Common Scoter, Velvet Scoter, Razorbill, Hoopoe, Fulmar, Kittiwake and Shag.

May 3 : Long Ashton Research Station—Leader Mr. G. E. Clothier.

May 30 : "The Withies," Chipping Sodbury. An evening meeting led by Mr. Culverwell.

June 14 : Newton Park College—Leader Miss S. Harris. The section was invited by the Principal of the College, Miss Dawson.

Aug. 20 : Hanham Gorge—Leader Mrs. P. M. Morris.

Sept. 13 : Leigh Woods—Leader Mr. Clegg. This expedition was for the purpose of studying snails.

Sept. 21 : Steart and Durleigh Reservoir.—Leaders Messrs. B. King and R. F. Wills aided by Miss E. Palmer.

Dec. 27 : The Wild Fowl Trust, Slimbridge—Leader Mr. B. King.

In addition to these Field Meetings expeditions were held under the leadership of Mr. B. King to Chew Valley or Blagdon Reservoirs in January, February and March and from September to November inclusive.

The Sectional Roll continues to increase in strength and the average attendance at lectures has risen. Field Meetings especially those outside the Bristol Area draw many enthusiastic members. During this year the help given by adult members of the Society has been very valuable and the section continued to invite interest and support from other sections.

Two new ventures have succeeded in drawing interest from adult friends of the section as well as providing amusement and interest for the section members. These were the New Year's Party on January 7 and the Exhibition Meeting. This meeting proved to be a great success, being well supported by exhibitors and viewers. An excellent section on preservation of specimens was compiled by Colin Godman and numerous members added to the Ornithological Section.

The Advisory Committee has remained unchanged for the past year.

E. R. MILLARD, *Hon. Secretary, Advisory Committee.*

SUSAN TAPP, *Hon. Secretary, Members' Committee.*

ACCOUNT OF THE GENERAL MEETINGS

1958

THE 95th Annual General Meeting was held on Thursday, January 23, when the Officers and Members of Council were duly elected. Miss M. H. Rogers was elected President in succession to Mr. Bassindale. Mr. Bassindale then gave a lecture on his visit to Ghana, and described the climate, and the types of vegetation found there. The life and habits of the fauna of the arid scrub and tropical forests were described. The lecture was illustrated by a film taken by the lecturer.

On February 27 Professor Harris lectured on Plankton and their importance to the fisheries of the world. They are the ultimate food of all life in the sea. The many questions asked showed the interest aroused by this lecture.

The Avebury District was the subject of Mr. Grant King's most interesting lecture on October 2. He spoke of the history of the early periods as shown by the various remains. He gave an account of the people, of their pottery and of the animal life. In the following spring he conducted a fascinating tour of the area.

Professor Sir Alister Hardy's lecture on Studies in Marine Plankton postponed from February, was given on October 30. Sir Alister described with clarity and humour his own ingenious devices for collecting data. He spoke of his own experiences in the Atlantic, the North Sea, and Antarctica.

For the last meeting, on November 27, Mr. W. H. Hogg, a member of the Society, spoke on " Weather Forecasting," with illustrations by lantern slide. He dealt with the obvious comments on the weather of the moment before they were uttered ! Then he told of the practical details involved in short range and long range forecasts. Members were shown how to criticize their own weather-lore myths.

A. CROOME LEACH, *Hon. Secretary.*

GENERAL FIELD MEETINGS

ELEVEN general field meetings took place during the year, a record number. For the first time meetings were held in January and March, and were well attended. We have therefore followed the excellent example shown by the Junior Section in holding field meetings throughout the year. The Society paid its first visit to Flatholm, and this was the most popular meeting of the year with 68 members present. As in the last two years only a brief summary of these meetings is given here, but a much fuller account is kept in the records of the Field Section.

Jan. 11 : Leader—Mr. H. G. Hockey. Brean Down.

Mar. 15 : Leader—Mr. H. G. Hockey. Cockercombe, Quantocks.

Apr. 26 : Leader—Miss C. Groves. Chedworth Roman Villa, Bourton-on-the-Water and the fritillary field at Oaksey.

May 17 : Leaders—Mr. and Mrs. D. A. C. Cullen. The Long Barrow at Leighterton, and Ozleworth Bottom.

June 18 : Leader—Mr. C. Bell. Bristol Zoo, by kind permission of the Director.

May 31 and June 1 : Leaders—Mr. and Mrs. R. F. Wills. A repetition of the all-night meetings held in the previous two years to hear the dawn chorus.

June 21 : Leader—Dr. A. F. Devonshire. Forest of Dean : The High Meadow Woods, Symonds' Yat, Foxes Bridge, the Roman Road at Blackpool Bridge, and the Roman Walls at Caerwent.

July 19 : Leader—Mr. H. G. Hockey. Flatholm. Five hours were spent on the Island.

Aug. 16 : Leaders—Mr. I. W. Evans and Mr. H. G. Hockey. Meare Heath to see the rich fen vegetation.

Sept. 6 : Leader—Mr. A. C. K. Fear. Corhampton, Cleeve Abbey, Nettlecombe, Brendon Hills, Selworthy and Minehead.

Oct. 18 : Leaders—Mr. C. E. Leese and Mr. F. S. Ross. Devizes Museum, and the Farm Institute at Lackham, where the party was shown round by the Warden.

A. F. DEVONSHIRE, *Hon. Field Secretary.*

BRISTOL BOTANY IN 1958

By Cecil I. and N. Y. Sandwith

THE weather of 1958 is best forgotten. A backward spring, with the coldest Easter of this century, was followed by a wretchedly wet summer with no long unbroken spell of sunny days. There was a drought in the autumn, with much fog, and the Christmas season was mild and damp with strong winds. It was not a bad year for botanists, as nothing was burnt up and plants grew luxuriantly and had a long flowering period.

In the early part of the year N.Y.S. went very carefully through Miss I. M. Roper's interleaved copy of White's *Flora of Bristol*, by kind permission of the Brotherton Library, University of Leeds. He extracted very many unpublished MS. records for our Card Index, sifting these from the numerous ones which have appeared in print and have already been indexed. Then, in September, we had the good fortune to examine for the same purpose Mr. White's own interleaved copy of his Flora, which is now in private hands. This added little unpublished information : Mr. White's attitude was eclectic and his notes were mainly those of the new localities of the rarer plants which are familiar to us. Miss Roper's copy is a far fuller and more scientifically kept record of additions made between 1912 and 1935, because she has filled so many gaps in the distribution of the commoner species for which the Flora gave lists of localities.

During the year Miss Agnes Fry died at Brent Knoll, aged 88. She was the daughter of Sir Edward Fry, of Failand House, and had been a keen student of Hepatics and Mycetozoa with her father, besides contributing a number of records to Mr. White's Flora.

We learn that the herbarium of Mrs. E. M. E. Bell, including that of H. J. Gibbons (see " Bristol Botany in 1957 "), has been presented to the Botany Department of the University of Leicester.

Mr. Peter Hunt writes that he believes he has located the whereabouts of the mysterious "Downhead Common", N. Somerset, from which Dr. H. F. Parsons and Messrs. J. W. White and David Fry recorded so many interesting plants more than fifty years ago. It is not marked on contemporary Ordnance Survey maps, and local inhabitants have not been helpful. The site is near Cranmore Tower and is now very overgrown with trees. Mr. Hunt would regard it as the easternmost bog of Mendip. He found an impressive number of species surviving there, including *Viola palustris*, *Scutellaria minor* and *Juncus squarrosus*, but saw no sign of *Drosera rotundifolia* or *Narthecium*.

Bristol botanists will no doubt provide themselves with a copy of the excellent new " List of British Vascular Plants ", prepared by Mr. J. E. Dandy at the British Museum (Natural History). There are many startling name-changes for well-known plants, some due to a strict application of the International Code of Botanical Nomenclature, others owing to a rejection of traditional generic concepts. The order of families follows that of Clapham, Tutin and Warburg's Flora, with modifications. In these notes we do not at present use that order, but we shall adopt such specific nomenclatural changes as are in accordance with the Code. The recognition of generic limits remains, however, in many instances a matter of opinion.

The names of certain contributors are abbreviated as follows :

A.J.W., Dr. A. J. Willis
D.C.P., Dr. D. C. Prowse
D.M.S., Dr. D. Munro Smith
G.W.G., G. W. Garlick
P.J.M.N., P. J. M. Nethercott
R.G.B.R., Commander R. G. B. Roe

Sisymbrium officinale (L.) Scop. var. *leiocarpum* DC. New Passage railway station, **G.**, *G.W.G.*

Bunias orientalis L. Calcareous grassland north-west of the Rocks, Marshfield, **G.**, *G.W.G.*

Cerastium pumilum Curt. On calcareous rubble, the Quarry, Chipping Sodbury, **G.**, *G.W.G.*

C. semidecandrum L. Quarry on north side of Priest Wood, Cromhall, **G.**, *G.W.G.*

Sagina nodosa (L.) Fenzl. On an old track through a marshy field near Windsor Hill, Shepton Mallet, **S.**, *R.G.B.R.*

Spergula arvensis L. var. *sativa* (Boenn.) Mert. et Koch. Path in Michael Wood, Stone, **G.**, *G.W.G.*

Hypericum humifusum L. Greyfield Wood, Clutton, **S.**, *C.I.S.* and *N.Y.S.*

Tilia cordata Mill. Wood between Lower Court and Cattybrook Farm, Over, **G.**, *G.W.G.* Park Wood, Ozleworth, **G.**, *id.* Probably planted in both stations.

Linum bienne Mill. Warren Hill, Cheddar, **S.**, *P.J.M.N.*

Oxalis europaea Jord. (*O. stricta* auct.). Roadside, Coalpit Heath, **G.**, *D.M.S.*, det. *D. P. Young*, who writes, "A new record for V.C.34." Harter's Hill, 2 miles south-west of Wells [not "Wookey"], **S.**, 1956, *V. S. Summerhayes* in Herb. Kew., fide *D. P. Young* in *Watsonia* 4, p. 69 (1958).

Melilotus altissima Thuill. Oldford, north of Frome, **S.**, *G. B. Milne-Redhead.* Whatley Bottom, **S.**, *Mrs. N. Wycherley.*

Trifolium medium L. Greyfield Wood, Clutton, **S.**, *C.I.S.* and *N.Y.S.*

T. scabrum L. Quarry at north end of Priest Wood, Cromhall, **G.**, *G.W.G.*

T. striatum L. Rough ground above railway tunnel, Tytherington, **G.**, *D.C.P.*

Vicia sativa L. With white flowers at Coalpit Heath, **G.**, *D.M.S.*

Filipendula vulgaris Moench. Four scattered patches at Boxwell and Ozleworth, **G.**, *G.W.G.*

Rubus ulmifolius Schott. An attractive, sporting form with the pink flowers converted into a " Bachelor's Button " mass of narrow petals, without stamens but with linear, whitish-tomentose carpels, was brought to *A.J.W.* in September last from sandstone on Trooper's Hill, **G.**

Potentilla anglica Laich. Railway embankment, Coalpit Heath, **G.**, 1957, *D.M.S.*, det. *Dr. D. H. Valentine.*

Aphanes microcarpa (Boiss. et Reut.) Rothm. Parkfield Colliery, Pucklechurch, **G.**, *G.W.G.*

Sorbus porrigentiformis E. F. Warburg. Wick Rocks, **G.**, and Asham Wood, **S.**, *P.J.M.N.*, confirmed by *Dr. Warburg.*

S. torminalis (L.) Crantz. One tree in Limeridge Wood, Tickenham, **S.**, *Sampson Clay.*

Cotoneaster horizontalis Decne. Old quarry, Leigh Woods ; and Burrington Combe, **S.**, *P.J.M.N.*

C. microphyllus Wall. ex Lindl. Leigh Woods, **S.**, *P.J.M.N.*, removing the possibility of doubt noted in " Bristol Botany in 1957 ".

Callitriche obtusangula Le Gall. Rhine at Pilning railway station ; and stream at Kilcot, **G.**, passed by *J. P. Savidge*, *G.W.G.* Rhine, Weston-in-Gordano moor, **S.**, 1956, *C.I.S.* and *N.Y.S.*

Peplis Portula L. Near Decoy Pool Farm, Westhay Heath, **S.**, *E. J. Hamlin* in *Rep. Bot. Sect., Som. Arch. and Nat. Hist. Soc.* for 1957. A first record for the peat moors.

Epilobium hirsutum L. × *parviflorum* Schreb. The Leechpool, **G.**, *G.W.G.* All Mr. Garlick's *Epilobia* have been confirmed by *Mr. G. M. Ash.*

E. montanum L. × *parviflorum* Schreb. Parkfield Colliery, Pucklechurch, **G.**, *id.*

E. lanceolatum Seb. et Mauri. Cattybrook Brick Works, Over, **G.**, *id.*

E. lanceolatum × *montanum.* Sandstone quarry, Winterbourne Station, **G.**, *id.*

E. adenocaulon Hsskn. Redland Green allotments, and from Eastville to Frenchay, **G.** ; Brislington and Uphill, **S.**, *P.J.M.N.* It will soon be unnecessary to give further localities for this species.

E. adenocaulon × *montanum.* Parkfield Colliery, Pucklechurch, **G.**, *G.W.G.*

E. adenocaulon × *parviflorum.* Ridge House, Yate ; and Parkfield Colliery, **G.**, *id.*

E. palustre L. Michael Wood, Stone, **G.**, *id.*

Bupleurum tenuissimum L. Seabank below Pill, **S.**, *P.J.M.N.*

Apium inundatum (L.) Reichb. fil. Pond north of Thornbury railway station, **G.**, 1957, *D.C.P.*

Œnanthe pimpinelloides L. Egford Hill, west of Frome, **S.**, *Mrs. N. Wycherley*, det. *Herb. Mus. Brit.*

Lonicera Caprifolium L. Orchardleigh, near Frome, **S.**, *Mrs. N. Wycherley*, det. *Herb. Mus. Brit.*

Galium Cruciata (L.) Scop. Boxwell Lodge and Ozleworth, **G.**, *G.W.G.*

G. pumilum Murr. Calcareous grassland between St. Catherine and Ashwicke Hall, Marshfield, **G.**, *G.W.G.* An excellent addition to the Glos. side of our area. There are similar localities on the Cotswolds in V.C.33.

G. uliginosum L. The distribution of this species in our district deserves investigation, and Mr. White's statement (*Flora*, p. 357) that it is " rather common " was questionable even in 1912. It certainly is not so at the present day. This species is a plant of fenland rather than of acid bogs. We have seen it on the Somerset side in the Gordano Valley and in Max meadows, and it is frequent on the peat moors. Many of the localities given by Mr. White, especially those close to the City and on the Glos. side, need verifying ; but they may have been destroyed by drainage or building.

Filago minima (Sm.) Pers. Slag heap, Parkfield Colliery, Pucklechurch, **G.**, *G.W.G.* Two plants on the slope of a spoil-heap by Greyfield Wood, Clutton, **S.**, *N.Y.S.*

Anaphalis margaritacea (L.) Benth. Rough track in a cleared portion of Greyfield Wood, Clutton, **S.**, *R.G.B.R.*

Cirsium dissectum (L.) Hill. Blackdown on Mendip, **S.**, *P.J.M.N.*

C. dissectum × *palustre* (L.) Scop. Pasture on Walton-in-Gordano moor, **S.**, *N.Y.S.*

Crepis biennis L. Ayford Farm, St. Catherine, **G.**, *G.W.G.*

Hieracium lepidulum (Stenstr.) Omang. " Near Bristol ", before 1849 and probably in **G.**, *G.H.K. Thwaites* in Herb. Kew., specimen identified by *P. Sell* and *C. West.* New to the district. Pugsley regarded this species as probably an introduction.

H. maculatum Sm. Wick Quarries ; Parkfield Colliery ; Priest Wood, Cromhall ; and Ayford Farm, St. Catherine, **G.**, *G.W.G.*

Cichorium Intybus L. Whatley Bottom, **S.**, 1957, *Mrs. N. Wycherley.*

Lysimachia vulgaris L. Pond under railway embankment north of Thornbury station, **G.**, *D.C.P.*

Atropa Belladonna L. Four large plants on waste ground, Nazareth House, Stoke Bishop, **G.**, *B. L. Carpenter.*

Scrophularia nodosa L. var. *Bobartii* Pryor. Berrow, **S.**, *P. G. Munro Smith.*

Veronica scutellata L. In quantity along a ditch in a pasture on Walton-in-Gordano moor, **S.**, *C.I.S.* Not previously recorded, we think, from the Gordano Valley but we learn that *Mr. R. L. Jefferies* found it in 1957 in two spots on the north side, one of them evidently identical with the above-mentioned site.

V. catenata Pennell. Hallen Marsh and Ingst, **G.**, *G.W.G.*

Mentha × *Smithiana* R. Graham (*M. rubra* Sm., non Mill.). Streamside, Windsor Hill, Shepton Mallet, **S.**, *R.G.B.R.*, det. *R. Graham.*

M. × *gentilis* L. (*M. arvensis* × *spicata*). The Abbot's Way, Edington, **S.**, *F. M. Day*, fide *R. Graham*, see *Proc. Bot. Soc. Brit. Is.* 3, pt. 1, p. 61 (1958).

Scutellaria altissima L. In a note in *Proc. Bot. Soc. Brit. Is.* 3, pt. 1, p. 47 (1958) *Dr. A. Melderis* shows that this is the correct name for the plant established near Mells, **S.**, which has for long been passing as *S. Columnae* Ten., a species with strongly hairy leaves and a much longer corolla. *Mr. Peter Hunt* informs us that the various records from " Wadbury Valley ", " wooded glen near Mells ", etc., refer to a single locality.

Lamium album L. forma *erubescens* Wats. ex C. E. Salmon. Roadside bank, Ozleworth Bottom, near Wortley, **G.**, *B.N.S. member* on excursion of May 17th, comm. *Mrs. W. Cummins.*

Daphne Laureola L. Two strong plants on Clifton Down, **G.**, *P.J.M.N.*

Hippophae rhamnoides L. Redcliffe Bay near Portishead, **S.**, 1958, *I.R.P. Heslop*, fide *E. W. Groves* in *Proc. Bot. Soc. Brit. Is.* 3, pt. 1, p. 6 (1958), where the history of this shrub at Berrow and Burnham is fully given in a paper on the occurrence of *Hippophae* in the British Isles.

Salicornia ramosissima Woods. Severn shore below Hallen, **G.**, *C. Bucknall* in *J. W. White* ms. This record, in Mr. White's interleaved copy of his Flora, antedates that in " Bristol Botany in 1953 ", which was the first published record of *S. ramosissima* for the Glos. side of the area. However, Mr. Garlick has made a series of gatherings of *Salicornia* along the Severn banks, from Berkeley down to Aust Ferry, and all his specimens have been identified as *S. ramosissima* by a new specialist in the genus, *Mr. P. W. Ball*, who includes *S. Smithiana* Moss in that species as a mere prostrate form. Thus the *Fl. Glos.* records of *S. Smithiana* from Berkeley and New Passage (*Day*) may safely be referred to *S. ramosissima*, but Mr. Bucknall's find quoted above was still, perhaps, the earliest. Mr. Garlick could not find *S. europaea* L. (*S. stricta* Dum.) anywhere, but it should occur, as it certainly grows not far off, at Portbury, **S.**

Euphorbia platyphyllos L. Cornfield, Wapley, **G.**, *D.M.S.*

E. uralensis Fisch. ex Link (*E. virgata* auct.). Grassy side of railway near Sheepway, between Portbury and Portishead, **S.**, *N.Y.S.*

Betula pubescens Ehrh. Cattybrook Brick Works, Over, **G.**, *G.W.G.* Abundant in carr on Walton-in-Gordano moor, **S.**, *A.J.W.*

Quercus petraea (Mattuschka) Liebl. New and unpublished localities noted in Mr. White's and Miss Roper's interleaved copies of the Flora are as follows: Durdham Down above Gully quarry, **G.**, 1929, *Miss Roper*; Hanham Woods near the Avon, **G.**, 1915, *J. W. White*; and Brockley Wood, **S.**, 1924, *Miss Roper.*

Orchis ericetorum (Linton) E. S. Marshall. Calcareous pasture, Boxwell to Ozleworth, **G.**, *G.W.G.*, who also collected a probable hybrid with *O. Fuchsii* Druce.

Coeloglossum viride (L.) Hartm. Above West Wood, Ozleworth, **G.**, *G.W.G.*

Spiranthes spiralis (L.) Chevall. At least a dozen plants on waste ground on the estuary below Pill, **S.**, *J. T. Roberts.* Plentiful at the eastern end of Goblin Combe, Wrington, **S.**, *R.G.B.R.*

Convallaria majalis L. A small number of plants in Leigh Woods, **S.**, fruited last year, *P.J.M.N.*

Scilla non-scripta (L.) Hoffmgg. et Link var. *bracteata* Druce. South-east of Thornbury, **G.**, comm. *D.C.P.* The bracts, uncoloured, were up to 8¾ inches in length.

Ornithogalum umbellatum L. A few plants in Haw Wood, Hallen, **G.**, *Dr. A. F. Devonshire.*

Juncus subulatus Forsk. Berrow salt-marsh, **S.**, well established in 1957, when first noticed by *Dr. A. J. Willis.* The writers were kindly conducted to the spot last September, by Dr. E. W. Davies. This is a Mediterranean species of salt-marshes, previously unknown in Britain. There are two large patches, which have obviously been there for some years, but the plant must have arrived since 1921, when H. S. Thompson first noted the rapid development of the Berrow salt-marsh vegetation. *J. subulatus*, a very distinct and isolated species, has a long, creeping rhizome, and the leafy stems reach a height of four feet, with a terminal panicle. Specimens were exhibited by Dr. Willis at the autumn meeting of the *B.S.B.I.*, and a full account will be published in *Watsonia.*

J. compressus Jacq. Marshy meadow, down for hay, on Catcott Heath, **S.**, *C.I.S.* We have seen no previous record from the peat moors.

J. effusus L. var. *compactus* Hoppe. Abundant locally on Walton-in-Gordano moor, **S.**, *A.J.W.* Not previously recorded but doubtless frequent.

Potamogeton Berchtoldii Fieb. Rhine, Hallen Marsh, **G.**, *G.W.G.* Pond near Holcombe Old Church, **S.**, *R.G.B.R.* Specimens from both localities were determined by *Mr. J. E. Dandy.*

Eleocharis uniglumis (Link) Schultes. Boggy pasture on Walton-in-Gordano moor, **S.**, *C.I.S.* and *N.Y.S.*

Carex strigosa Huds. Seven Springs, Ozleworth, **G.**, *G.W.G.* Fry's Bottom Wood, north of Clutton, **S.**, *Dr. A. F. Devonshire.*

C. polyphylla Kar. et Kir. Alderley, Ozleworth and Boxwell, **G.**, *G.W.G.* Lane from Batheaston to Upper Swainswick, **S.**, *id.* The specimens were passed by *Mr. E. Nelmes.*

Alopecurus geniculatus L. var. *bulbosus* Sonder. Plants with swollen bulbous roots, simulating those of *A. bulbosus* Gouan and constant in cultivation at Kew, have been found by *G.W.G.* on Inglestone Common, Wickwar, **G.**, and may be referred to this variety, according to *Mr. C. E. Hubbard.*

Agrostis stolonifera L. var. *palustris* (Huds.) Farw. Pond, Onepool Farm, Iron Acton, **G.**, *G.W.G.*

Calamagrostis Epigejos (L.) Roth. Summit of Blackdown on Mendip, **S.**, *R. L. Jefferies.* Cheddar Gorge, **S.**, *Miss E. Overend.*

Deschampsia caespitosa (L.) Beauv. var. *parviflora* (Thuill.) Coss. et Germ. Dodington Ash; Lower Woods, Wickwar; Kilcot; and Ozleworth, **G.**, *G.W.G.*

Koeleria vallesiana (Honck.) Bertol. Shute Shelve Hill, **S.**, *Dr. J. F. Hope-Simpson.*

Glyceria declinata Bréb. Pond at Downend, **G.**, *D.M.S.*

Festuca rubra L. × *Vulpia membranacea* (L.) Dum. Not uncommon on Berrow dunes, **S.**, *J.F.* and *P. C. Hall,* see *Proc. Bot. Soc. Brit. Is.* 3, pt. 2, p. 201 (1959). The first record for our area of this interesting hybrid which has only recently been detected in Britain.

Botrychium Lunaria (L.) Sw. Calcareous pasture, Boxwell to Ozleworth, **G.**, *G.W.G.*

ALIENS. *Camelina sativa* (L.) Crantz. Tip, Widdin Hill, Horton, **G.**, *G.W.G.*

Trigonella hamosa L. Avonmouth Dock, **G.**, *C.I.S.* and *N.Y.S.* New to Bristol. The pods are less strongly falcate than in the typical form, and the specimens could perhaps be referred to *T. uncata* Boiss. et Noë, which is doubtfully distinguishable as a species.

Melilotus alba Medic. Bank of widened road, Kingsweston Lane, **G.**, in quantity in 1957, *B. L. Carpenter.*

M. indica (L.) All. Waste ground, Frenchay, **G.**, *D.M.S.*

Coronilla varia L. Walls of ruin, Downhead Mill, **S.**, *R.G.B.R.*

Vicia pannonica Crantz var. *pannonica.* With *Lathyrus Aphaca* L. on celestine rubble, Spar Pools, Yate, **G.**, *G.W.G.*

Lathyrus palustris L. var. *pilosus* (Cham.) Ledeb. Swampy hollow in sand-dunes, Berrow, **S.**, *D.M.S.*, det. *N.Y.S.* Dr. Munro Smith's specimen was found to differ from all the British and Continental European material at Kew in the copious, curly-pilosulous pubescence on all vegetative parts. It thus agrees with the var. *pilosus*, which is common in both N. America and N. Asia, and the plant may be assumed to be a recent introduction at Berrow, where the native form of *L. palustris* has never been found and would be most unlikely to occur.

Carum Carvi L. Owl's Nest Common, Alveston, **G.**, two isolated plants in 1957, *D.C.P.*

Helianthus laetiflorus Pers. Old quarry near Twerton, Bath, **S.**, 1935, *J. P. M. Brenan.*

H. Maximiliani Schrad. Black Rock Quarry, Avon Gorge, **G.**, 1935, *id.* A first record for Bristol.

Anthemis tinctoria L. Quarry by Greyfield Wood, Clutton, **S.**, *C.I.S.*

Campanula rapunculoides L. Wall-top, Winterbourne Down, **G.**, *D.M.S.*

Lysimachia punctata L. Waste ground, Frenchay, **G.**, *D.M.S.*

Datura Stramonium L. var. *Tatula* (L.) Torr. Waste ground near Oakhill, **S.**, *Mrs. Gait*, comm. *F. M. Pilkington.*

Salvia Sclarea L. Quarry by Greyfield Wood, Clutton, **S.**, *C.I.S.* A garden outcast, like *Anthemis tinctoria* which grew with it.

Plantago indica L. Cabbage field, Dodington Ash, **G.**, *G.W.G.*

Chenopodium glaucum L. Avonmouth Dock, **G.**, 1957, *J. E. Lousley*, det. *J. P. M. Brenan.*

Bromus madritensis L. Rubbish-tip, Weston-in-Gordano, **S.**, *A.J.W.* and *R. L. Jefferies.*

BRISTOL BIRD REPORT

1958

COMPILED BY THE EDITORIAL COMMITTEE OF THE
B.N.S. ORNITHOLOGICAL SECTION

B. K. BROOKE H. H. DAVIS
P. J. CHADWICK R. H. POULDING
M. A. WRIGHT

BEFORE reviewing the contents of this Report, the twenty-third in the present series, we should like to take this opportunity to thank all those who have contributed their observations for 1958.

The event of the year was undoubtedly the finding of a dead Bridled Tern at Sand Bay in October—the first record for the Bristol Area. Only three other specimens have occurred in the British Isles, all of which were also found dead. Other interesting records from the Severn Estuary were a Great Snipe at the New Grounds in January, a Lesser White-front there in February, and a Bittern in February–March ; while in December two Greenland White-fronts were identified. Farther south, up to 450 Ringed Plover were present at Sand Bay in August and two Dotterel were seen on Sand Point on September 5 (Dotterel were also recorded about this time at the south and west coast observatories on Portland Bill, Lundy, Gt. Saltee and Jersey). An October visit to Steep Holm by members of the Steep Holm Trust Gull Research Station proved most timely since a movement of Kittiwakes was noted in mid-Channel which would not otherwise have been recorded. Evidently all the birds successfully returned to sea as a negative result was obtained when members of the Research Station's newly formed " wrecked sea-birds " organisation made a special search of the reservoirs and the whole coastline from the New Grounds to Bridgwater Bay on the following week-end.

Among the more unusual visitors to the reservoirs were two Bean Geese with a party of White-fronts at Chew Valley in late January to mid-February ; a Long-tailed Duck at Cheddar from January to May and up to five at Chew Valley in March–April ; a pair of Common Scoters at Cheddar and a party of fifteen at Chew Valley in early April, while three were seen at Blagdon in mid-June. Chew Valley reservoir also provided records of a party of nine Water

Pipits in April, more than the total of all previous records for the District; an early Hobby in the first few days of April; a Little Ringed Plover in August; and Wood Sandpipers, Spotted Redshanks and Ruffs in August-September.

Observations from other areas include reports of a Shag killed at Pensford in late January a few days after an inland " wreck " of this species had occurred in Great Britain, and it seems highly probable that a bird caught in Bristol on the previous day was also a Shag. A Waxwing was seen at Aust in January and two at Fishponds, Bristol in February; single Hoopoes visited Cheddar and Dursley in April, Wotton-under-Edge in May, and one was unfortunately shot at Nailsea on November 12. An exceptional record, if referring to a truly wild bird, is that of a Snow Bunting in a schoolyard near Dursley in early May, while later in the month a Woodchat Shrike was seen on the Cotswolds near Dursley—the first record of this species for over 70 years and only the second reliable record for the Bristol Area.

At least 40 pairs of Tufted Duck bred successfully at Chew Valley reservoir and another pair was seen with ducklings at Chew Magna reservoir. From Chew Valley reservoir there are also reports of a pair each of Gadwall, Pochard and Shelduck nesting, the Gadwall and Shelduck being successful but the fate of the Pochard's nest is not known. Of equal, if not greater, interest was the finding of a Curlew's nest on Walton Moor near Clevedon—the first definite report of breeding since 1925.

In the systematic list that follows records refer only to 1958 unless otherwise stated and are largely the result of contributions by the following *members* :—R. Angles, A. E. Billett, P. F. Bird, H. J. Boyd, Col. and Mrs. G. A. Bridge, B. K. Brooke, G. C. Buxton, Mrs. S. I. Buxton, P. J. Chadwick, S. E. Chapman, G. E. Clothier, Miss D. M. Crampton, H. H. Davis, Miss P. Farmer, G. A. Forrest, Miss C. Graham, D. R. Hamblett, G. H. Hamilton, R. G. Hamilton, Rev. G. Hamlin, H. R. Hammacott, C. Hockey, H. G. Hockey, D. A. Holmes, W. A. Holmes, B. King, R. C. Matthews, Mrs. J. Matthews, T. D. H. Merrie, W. J. Munden, H. W. Neal, P. J. M. Nethercott, E. G. M. Niblett, Mrs. B. C. Palmer, Miss E. M. Palmer, R. H. Poulding, J. A. Pryce, J. D. Read, Miss S. Richards, W. L. Roseveare, J. Rowe, J. H. Savory, P. Scott, T. B. Silcocks, P. T. Sims, L. Sullivan, G. Sweet, Miss S. Sweet, S. M. Taylor, P. Tibbs, J. Vallis, J. D. R. Vernon, M. Waddicor, N. Webb, J. A. F. Wilkins, Mrs. D. A. Wills, R. F. Wills, M. A. Wright and K. B. Young. *Non-member* contributors are :—G. L. Boyle, Mrs. M. L. Butterworth, C. Craxton-Smith, M. Davy, A. G. Dixon, N. Dudley, A. C.

Gambier, J. Gould, E. G. Holt, S. T. Johnstone, Miss A. M. P. Judd, J. Kenny, R. J. Lewis, B. Little, J. A. McGeoch, S. G. Madge, P. J. Olney, M. H. Port, Mrs. B. Richards, G. Rudebeck, W. Smith, Miss U. Stevens, Dr. C. N. Vaisey, T. P. Walsh and M. G. Wilson. Observations are followed by the appropriate initials throughout. The initials D.B.P.S. denote records supplied by the Dursley and District Bird Watching and Preservation Society, and the abbreviations Res. Stn. and Jnr. Sect. refer respectively to the Steep Holm Trust Gull Research Station and the B.N.S. Junior Section.

The area covered is that part of Gloucestershire (**G.**) lying east of the Severn and south of a line from the New Grounds to the County boundary at Tetbury, and Somerset (**S.**) north of the R. Axe and a line from Wells to the County boundary near Frome. For the purpose of this Report the area extends westwards into the Channel and Estuary to include the promontory of Brean Down, and the islands of Steep Holm and the Denny (cf. Sketch Map, *Proc. B.N.S.*, 1947, p. 225).

GREAT NORTHERN DIVER *Gavia immer*

S. Single bird, Blagdon res., Jan. 8, 12 (S.E.C., B.K. *et al.*) ; one, Cheddar res., Nov. 13 to end of Dec. (B.K., J.A.McG.) but two, Nov. 16 (J.A.McG., M.G.W.) ; one, Chew Valley res., Jan. 19 (G.C.B., S.I.B.) and Feb. 16 (S.E.C.).

RED-THROATED DIVER *Gavia stellata*

S. An oiled bird first seen, Cheddar res., Jan 5, found freshly dead on 8th (B.K., J.A.McG.). One, seen frequently, same res., Jan. 19 to Mar. 31 by various observers. Single bird, Chew Valley res., several dates, Mar. 16 to Apr. 2 (G.C.B., S.I.B. *et al.*).

GREAT CRESTED GREBE *Podiceps cristatus*

S. Max. winter reservoir counts: 22, Cheddar, Jan. 5 (J.A.McG.); five, Blagdon, Feb. 6 (G.C.B., S.I.B.) ; and 18, Chew Valley, Mar. 16 (W.A.H., T.D.H.M.). Four pairs, Blagdon res., May 3 (B.K.), all subsequently rearing young (P.J.C.). At Chew Valley res., nine nests with eggs found, May 18 (A.E.B.) and at least 13 pairs present, June 22 (B.K.). Early autumn totals of 56, same place, Sept. 14, and 34, Oct. 12 (G.C.B., S.I.B.).

SLAVONIAN GREBE *Podiceps auritus*

S. One, Cheddar res., Feb. 16 to Mar. 2 (J.A.McG., T.B.S. *et al.*).

LITTLE GREBE *Podiceps ruficollis*

S. Few breeding records, particularly from minor waters: pair with two young, Chew Magna res., July 19 (P.J.C.); seven broods, Chew Valley res., Aug. 10 (B.K.); and four broods reported, Blagdon res., Oct. 5 (T.B.S.). Autumn counts of 36, Chew Valley, Oct. 12 (G.C.B., S.I.B.) and 20, Blagdon, Dec. 6 (B.K.).

FULMAR *Fulmarus glacialis*

S. One in flight off south side of Steep Holm, June 8 (B.L. per Res. Stn.).

GANNET *Sula bassana*

S. Oiled adult found dead, Sand Bay, Jan. 26 (R.A.).

CORMORANT *Phalacrocorax carbo*

G. One, high over Filton, Sept. 20 (T.D.H.M.) and a single bird flying south, Knowle, Bristol, Nov. 1 (G.C.B., S.I.B.).

S. Reservoir records show little change from previous year with max. numbers again at Cheddar in winter—ten, Jan. 19 (J.A.McG.) and Feb. 8 (B.K.). First winter bird on R. Avon, Twerton, nr. Bath, for two weeks in Feb. (R.J.L.). Thirty-two occupied nests, Steep Holm, May 4 (Res. Stn.). Party of 14 in flight, Sand Bay, Sept. 21 (R.A.).

SHAG *Phalacrocorax aristotelis*

G. Juvenile ringed, Farne Isles, 6/7/57, found oiled and later destroyed, Avonmouth, 31/12/57 (C.C-S. per G.E.C.). One, either this or previous species, found in street, Kingswood, Bristol, Jan. 26—subsequently released at Clevedon by R.S.P.C.A. official.

S. One, killed by car, Pensford, Jan. 27 (G.E.C., W.J.M.).

HERON *Ardea cinerea*

S. Twenty-seven occupied nests, Brockley Combe, Apr. 26: extensive tree felling in December may have reduced this old heronry (B.K., B.R., S.R. *et al.*). Other heronries: four, possibly six, occupied nests, Newton Park, Newton St. Loe, Apr. 20 (R.J.L.) and 21 occupied nests, Uphill Grange on 23rd (W.L.R.).

BITTERN *Botaurus stellaris*

G. One in, or near, W.T. enclosures, New Grounds, Feb. 1, 3 and Mar. 19 (M.D., P.J.O., P.S.).

MALLARD *Anas platyrhynchos*

G. Thirty on wet pasture, Little Sodbury, Jan. 18 (W.A.H.). Highest total, New Grounds—over 1,800, Sept. 15 (H.J.B.).

S. Frequent winter and autumn counts of up to 200, several localities, Weston Bay area but no estimate made of total population: max. counts of 176, Sand Bay, Jan. 11, and 180, Nov. 30 (T.B.S.); 140, Axe Estuary, Oct. 8 (E.G.H.); and 202, Weston Bay, Dec. 26 (T.B.S.). Other coastal counts include: 122, Yeo Estuary, Aug. 17 (T.B.S.) and 121 on 26th (W.L.R.); 310, Clevedon, Oct. 11 (B.K.). Highest reservoir totals of 411, Chew Valley, Jan. 19, and 491, Feb. 16 (G.C.B., S.I.B.) with autumn peak of 702, Sept. 20 (B.K.); 191, Blagdon, Jan. 22 (B.K.B.) and 428, Aug. 31 (P.J.C.). Barrow Gurney returns of 102, Feb. 16, and 214, Dec. 15 (G.E.C.): at Cheddar, winter and autumn maxima were 85, Feb. 16, and 165, Nov. 30 (J.A.McG.). Breeding reported from Chew Valley res. (at least 25 broods), Blagdon and Litton resrs.; also at Newton Park Lake (Jnr. Sect.), Sand Point (T.B.S.) and Walton Moor, nr. Clevedon (R.A.).

TEAL *Anas crecca*

S. Coastal counts include: 97, Clevedon to Yeo Estuary, Jan. 19 (P.J.C., M.A.W.); 86, Yeo Estuary, Nov. 30 (T.B.S.); and 140, Sand Bay, Dec. 25 (T.B.S.). Highest reservoir counts from Chew Valley, Jan.–Mar.: 500, Jan. 19 (G.C.B., S.I.B.); 477, Feb. 2 (P.J.C., M.A.W.) and 1,046 on 16th (G.C.B., S.I.B.). Unusually scarce, Blagdon res.—55, Sept. 14 (B.K.B.) and up to 20 on several dates in December (S.E.C., W.L.R.).

GARGANEY *Anas querquedula*

G. One in pens, New Grounds, early Feb.–Apr. (S.T.J.).

S. Pair, Cheddar res., Mar. 23 to Apr. 12 (W.A.H., J.A.McG., G.S.) and a male, May 4 (J.A.McG.). Single birds, Chew Valley res., Apr. 4, 6 (P.T. *et al.*); four, same place, Apr. 7 (D.A.W., R.F.W.); one, Apr. 23 (G.S.) and a pair on 25th (S.E.C.). Single male, Blagdon res., Apr. 12, 13 (B.K.B., A.G.D.); and two pairs, Clapton Moor, nr. Clevedon, on 12th (H.W.N.).

GADWALL *Anas strepera*

S. Reservoir population continuing to increase and successful breeding reported for the first time. Recorded all months, Chew Valley, with notable counts of eleven, Jan. 2 (A.G.D., S.G.M.); 13, April. 13 (G.C.B., S.I.B.); 30, Sept. 14 (P.J.C., M.A.W.) and 26, Nov. 9 (S.E.C.). Female with eleven well grown ducklings, same place, July 26 (B.K.), Aug. 4, 5 (P.J.C., M.A.W.). Ten, Litton res., Feb. 16 (D.A.W., R.F.W.), 22 (S.E.C.); and a pair, Blagdon res., Dec. 6 (B.K.).

WIGEON *Anas penelope*

G. Winter counts of 1,500, New Grounds, Jan. 13, 14 (P.J.O.); 2,500, Jan. 25 (B.K. N.W.) and 1,300, Feb. 18 (H.J.B.).

S. Coastal records: 71, Weston Bay, Jan. 26 (P.J.C., M.A.W.) and 127, Kingston Seymour, same date (T.D.H.M.); 31, Sand Point, Dec. 28 (R.A.). Present in large numbers Chew Valley res., Jan.–Apr., with max. monthly totals of 1,700, Jan. 19, and 1,650, Feb. 16 (G.C.B., S.I.B.); 987, Mar. 2, and 470, Apr. 6 (B.K.). Summer records of a single female, same place, May 3, 11, Aug. 23 (B.K.), 24 (P.J.C.); single male, May 23 and June 22 (S.E.C.). Autumn max. of 674, Nov. 16 (G.C.B., S.I.B.). Winter numbers at Blagdon res. not exceeding 220—Feb. 6 (B.K.)—with highest autumn count of 188, Dec. 14 (B.K.B.). Largest number noted, Cheddar res.—80, Mar. 2 (J.A.McG.).

PINTAIL *Anas acuta*

S. Larger numbers than in recent years reported from Chew Valley res., with max. counts of 74 (45 males), Feb. 16 (G.C.B., S.I.B.); 36, Mar. 2 (S.E.C., B.K.) and 25, Dec. 21 (B.K.). A pair, same place, Apr. 19 (B.K.) and May 18 (P.J.C., M.A.W.), also two males and two females on late date of June 19 (G.S.). Recorded in smaller numbers at other resrs.—four, Barrow Gurney, Mar. 2 (P.J.C., M.A.W.); one, Blagdon, Feb. 6 (G.C.B., S.I.B.) and two, Mar. 16 (B.K.B.); one, Cheddar, Feb. 16, and seven, Mar. 2 (J.A.McG.).

SHOVELLER *Spatula clypeata*

S. High concentrations at Chew Valley res. in period Jan. to Apr.—notable counts of 288, Jan. 26 (B.K.); 307, Feb. 8 (S.E.C.); 477, Mar. 16 (G.C.B., S.I.B.) and 175, Apr. 7 (B.K.). Smaller numbers, autumn, same res., with monthly maxima between 80, Sept. 14 (G.C.B., S.I.B.) and 116, Dec. 21 (S.E.C., B.K.). Scarce or absent at other reservoirs, highest counts notified were 26, Cheddar, Mar. 2 (J.A.McG.) and 40, Blagdon, Dec. 14 (B.K.B.). No records received from Barrow Gurney and Litton resrs. Four, Newton Park Lake, Mar. 16, Apr. 4 (R.J.L.). Breeding reported, Chew Valley res., where B.K. noted four broods, June 28 (34 ducklings) and July 10 (27 ducklings), while P.J.C. records five broods (43 ducklings), July 6.

SCAUP *Aythya marila*

S. Several records of a single female, Blagdon res., Feb. 16 to Apr. 4 (B.K.B., G.L.B., B.K.) and Dec. 30 (M.A.W.); also solitary female seen, Cheddar res., Mar. 23 to Apr. 27 (J.A.McG., G.S.). One, occasionally two (male and female), Chew Valley res., Jan. 19 to Apr. 16 (G.C.B., S.I.B., N.W. *et al.*) but two males, Apr. 19 (B.K.).

TUFTED DUCK *Aythya fuligula*

S. Present in considerable numbers throughout year, Chew Valley res., with winter peak of 433, Feb. 16, and autumn max. of 356, Nov. 16 (G.C.B., S.I.B.). High spring and summer counts by B.K. include: 394, Apr. 24; 290, May 25; and 123 adults, June 28. Further increase in breeding population, same res., where at least 40 broods identified July–Aug. (P.J.C., B.K.). Survey, July 19 by P.J.C. showed 33 broods comprising over 223 ducklings; while adults and juveniles totalled 327, Aug. 16 (B.K.). Barrow Gurney resrs.: max. numbers—60, Feb. 16 (G.E.C.) and 51, Oct. 5 (P.J.C.). Blagdon res.: peak counts—189, Feb. 6 (G.C.B., S.I.B.); 197, Mar. 16 (B.K.B.); 346, Nov. 14, and 389, Dec. 14 (B.K.B.). Winter max., Cheddar res. of 30, Feb. 1, and autumn counts of 28, Nov. 30, and 53, Dec. 14 (J.A.McG.).

POCHARD *Aythya ferina*

S. Winter counts of 590, Cheddar res., Jan. 5, and 460, Feb. 1 (J.A.McG.): exceptionally high numbers in autumn, same res., with *c.* 1,100, Nov. 30 (J.A.McG.); 1,215, Dec. 7 (P.J.C., M.A.W.) and *c.* 1,050 on 14th (J.A.McG.). Max. counts from other main resrs. also occurred in autumn—160, Chew Valley, Nov. 16 (G.C.B., S.I.B.) and 368, Blagdon, Dec. 14 (B.K.B.). Thirty-three, Jan. 19, and 21, Dec. 15 (G.E.C.) are the only noteworthy counts from Barrow Gurney reservoirs.

Nest, containing six eggs, found in reeds, Chew Valley res., June 4, by A.E.B., who obtained good views of the duck and also a nearby drake. First breeding record from the reservoir.

GOLDENEYE *Bucephala clangula*

S. Reported in smaller numbers than in recent years at resrs. Up to six, Blagdon, Jan. to late Apr. (G.C.B., P.T. *et al.*) and five, Dec.

9, 14 (B.K.B., W.L.R.); two, Cheddar, Feb. 1 (J.A.McG.) and Dec. 21 (T.B.S.). Frequently noted, Chew Valley res., Jan.–May and Oct.–Dec. with max. counts of seven, Feb. 16 (G.C.B., S.I.B.); nine, Apr. 6 (T.B.S.); three on late date of May 3 (B.K.); and thirteen, Nov. 16 (G.C.B., S.I.B.).

Long-tailed Duck *Clangula hyemalis*

S. A female, first seen in Oct. of previous year, Cheddar res., remained throughout winter (various observers) and was last seen, May 15 (W.L.R.). Two males, Chew Valley res., Mar. 29, and two males and three females, an unusual number inland, same place, Apr. 19 (B.K.). Further Long-tailed Duck observations from Chew Valley res. are not in accord with those given above and it seems likely that there has been confusion between this species and North American Ruddy Ducks (*Oxyura jamaicensis*) at the reservoir which have escaped from the Wildfowl Trust at Slimbridge.

Common Scoter *Melanitta nigra*

S. Unusual spring records from the resrs.—pair, Cheddar, Apr. 4 (B.K., G.S.); 15 (eight males), Chew Valley, Apr. 6 (B.K., T.B.S.) and three males, Blagdon, June 16 (B.K.). Female or immature with probable male, Cheddar res., Aug. 3 (P.J.C., M.A.W.) and single female, same place, Dec. 28, 29 (S.E.C., J.A.McG.). Autumn coastal records of two off Sand Point, Nov. 23 and a female, Sand Bay, Nov. 30 (T.B.S.); four females off Brean Down, Dec. 13 (T.B.S.) and three females or immatures, Weston Bay, Dec. 7, 22 (P.J.C., M.A.W.).

Smew *Mergus albellus*

S. Female or imm., Blagdon res., Jan. 25 (W.A.H., T.D.H.M.), and four, Feb. 23 (D.A.H., T.D.H.M.), Mar. 13 (W.L.R.). Frequently noted Chew Valley res., Jan.–Mar.: max. counts of 15, Jan. 9 (S.E.C.); 16, Jan. 19, and nineteen (including three ad. males) on 26th (P.J.C., M.A.W.). Solitary ad. male, same res., Dec. 21 (S.E.C., B.K.).

Goosander *Mergus merganser*

S. Many records from resrs. throughout winter though smaller numbers again evident. Up to three, Blagdon, Jan. 12 to Mar. 29 (B.K.B., G.S., P.T. *et al.*) and one, Dec. 6 (B.K.). Male and female, Cheddar, several occasions, mid-Feb. to early Apr. (J.A.McG., T.B.S.) and a single male, Dec. 7–21 (P.J.C., M.A.W. *et al.*). Three or four, Chew Valley, several dates, Feb.–Mar. (G.C.B., S.I.B. *et al.*) but six, Mar. 29 (B.K.).

SHELDUCK *Tadorna tadorna*

G. and **S.** A survey of the coast from Weston-super-Mare to Sharpness by 38 members, and extended to the northern end of The Noose sands, New Grounds, by the Wildfowl Trust staff, showed approx. 600 birds present in early May. Although 75% paired, many were immature. First young observed at beginning of June, and it was estimated that 52 broods comprising about 366 ducklings were brought to the water. Last full count, July 13, showed survival of 307 young (per S.M.T.).

Chew Valley res. records : six, Feb. 2 and up to four, Mar.–May (B.K.) ; pair with ten ducklings, June 19 to July 22 (B.K., G.S. *et al.*) but only six juveniles on 26th (B.K.). Autumn coastal counts include : 666, Weston Bay, Oct. 28 (W.L.R.).

WHITE-FRONTED GOOSE *Anser albifrons albifrons*

G. Records from the New Grounds are of 3,000 for most of Jan., with total decreasing during snowy weather in early Feb. but rising again to a winter max. of 4,600 on 16th (H.J.B., P.S.). Number still about 4,000, Mar. 3, falling to 1,500 on 11th and just over 1,000 on 12th. Total remained thus till Mar. 24 and though 720 still present on 27th or later only two were left Apr. 2 (figures recorded are the highest yet for second half of Mar.) (H.J.B.). 70 flying low over Thornbury, Jan. 5 (T.D.H.M.). First autumn record, New Grounds, three, Sept. 28 ; slow increase, Oct., to 170 on 31st, with Nov. totals rather lower but following influx in early Dec. numbers exceeded 700 on 9th and remained at that level till close of the month when the birds had increased to 920 by 28th and 1,200 on 29th (H.J.B.). Four low overhead between St. George and Hanham, Bristol, Nov. 25 (H.G.H.).

S. Fifty, probably White-fronts, flying up-Channel off Sand Point, Feb. 9 (T.B.S.) ; 42 seen, Weston-super-Mare, same date (R.H.P., M.A.W.). About 80 flying north over Hinton Blewitt, Feb. 15 (D.A.H., W.A.H.). Noted in varying numbers and on many occasions, Chew Valley, early Jan. to early Mar. and though sometimes seen on the water were usually in fields at north end of the reservoir (P.J.C., M.A.W. *et al.*). First reported (26, birds), Jan. 2 (A.G.D., S.G.M.) but numbers had increased to more than 100 by early Feb. (B.K.B., J.A.McG., E.M.P., Jnr. Sect.), with max. of 120, Feb. 2 (B.K.) ; 55 still remaining, Mar. 2 (B.K.). Thirty overhead, Newton Park, nr. Bath, Nov. 30 (R.J.L.). One, Chew Valley res., Dec. 7 (B.K.), 18 (A.G.D.) and two on 21st (B.K.). Single bird, Wick St. Lawrence saltings, Dec. 27 (T.B.S.).

GREENLAND WHITE-FRONTED GOOSE *Anser albifrons flavirostris*

G. One identified, New Grounds, Dec. 27 (Jnr. Sect.), 30 (M.D., P.J.O.). Two reported, same place, Dec. 28 (N.D.).

LESSER WHITE-FRONTED GOOSE *Anser erythropus*

G. Reported once only : a single adult, New Grounds, Feb. 11 (M.D.).

BEAN GOOSE *Anser arvensis*

S. One, with White-fronts, in fields adjoining Chew Valley res., Jan. 26 and two, Feb. 2, 8, 9 ; birds identified and fully described by P.J.C., B.K., R.H.P., and M.A.W.

PINK-FOOTED GOOSE *Anser brachyrhynchus*

G. New Grounds : occasional small parties early in year ; nine, Apr. 4 (unusually late date) being the most (H.J.B.). First in autumn, same place, six, Sept. 27 ; further arrivals, mid-Oct., when total reached 42 (H.J.B.). All had gone by Nov. 14 but several very small groups reported later, and flocks of 30 and 61 seen, Dec. 30, 31 (M.D., P.J.O., C.N.V.).

S. One, a ringed bird, with White-fronts, in fields at Chew Valley res., Jan. 26, Feb. 2 (P.J.C., B.K., M.A.W., Jnr. Sect.).

BARNACLE GOOSE *Branta leucopsis*

G. Up to three on saltings, New Grounds, various dates, Jan 3 to Mar. 27 (H.J.B.). A few, same place, in autumn were all apparently strays from the W.T. collection (H.J.B.).

BRENT GOOSE *Branta bernicla*

G. Two, both dark-breasted form *B. b. bernicla*, New Grounds, Jan. 9 : one or the other being seen on at least eight other dates, Jan. 3 to Mar. 23 (H.J.B.).

BEWICK'S SWAN *Cygnus bewickii*

G. Up to 16 on Estuary, New Grounds, various occasions, Jan. 5–26 (P.J.O., P.S.). Up to five present, same area, second half of Mar.—four visiting W.T. enclosures from 20th to 23rd (H.J.B., S.T.J., P.S.).

S. Five ads., Blagdon res., Jan. 4 (S.G.M.) and thirteen (11 ads., 2 imms.) on 25th (W.A.H., T.D.H.M.). Eleven (5 ads., 6 imms.), Chew Valley res., Jan. 6 (S.G.M.).

BUZZARD *Buteo buteo*

G. Single birds, Michael Wood, nr. Tortworth, Mar. 3, Apr. 27, 30; two, North Nibley area, Apr. 10, 18, May 4, and one, Sept. 22; one, Breadstone, Berkeley, Apr. 20, and three, Ozleworth Bottom, nr. Wotton-under-Edge, May 11 (D.B.P.S.). One, Doddington, Apr. 27 (R.H.P.).

S. Reported, usually singly or in pairs, during nesting season from Chewton Mendip, Newton St. Loe, Norton St. Philip, Long Ashton Clapton Moor, Bishop Sutton, Redhill, Blagdon, Winscombe and Cheddar areas, but no evidence of breeding. Two, Blagdon, Jan. 26, Mar. 15 (G.S.); three, Litton res., Feb. 16 (R.J.L.). Single birds, Walton Moor, nr. Clevedon, Mar. 1 (M.A.W.); Leigh Woods, July 15 (J.A.F.W.); Weston-super-Mare, Aug. 26 (R.A.); Nailsea Aug. 30, Oct. 12 (H.R.H.); Cheddar, Nov. 1 (S.E.C.); Brockley Combe, Nov. 9 (G.C.B., S.I.B.); and West Harptree area, Dec. 21 (S.E.C.).

SPARROW HAWK *Accipiter nisus*

S. Two, Steep Holm, Mar. 15; one, Mar. 17 and female on 18th; immature male, caught in trammel net and ringed, same place, May 3 (Res. Stn.).

MONTAGU'S HARRIER *Circus pygargus*

G. A "ring-tailed" harrier being mobbed by Rooks was seen at Marshfield on May 25 by B.K., who records that it was probably of this species.

HOBBY *Falco subbuteo*

G. Single bird, Little Stoke, July 14 (H.H.D.); another seen to take a Swift, New Grounds, Aug. 6 (G.R.); single birds, Wotton-under-Edge, Sept. 9, 14, 16 (D.B.P.S.).

S. One, Chew Valley res. on very early date of Apr. 7 (B.K.). Single bird calling in flight, Chelvey, July 25 (H.H.D.).

PEREGRINE *Falco peregrinus*

G. Single birds, New Grounds, Nov. 23 (B.K.), Dec. 27 (Jnr. Sect.). One, Purton, Dec. 9 and two on 30th (D.B.P.S.).

S. Frequently noted at coastal localities, mostly in spring and autumn, but no evidence of successful breeding. Inland records: immature, Chew Valley res., Aug. 8 (G.L.B.), and an adult soaring, same place, Sept. 20 (H.H.D., B.K.).

MERLIN *Falco columbarius*

G. Female or immature, Slimbridge, Nov. 15 (B.K.).

S. One reported nr. Uphill, Weston-super-Mare, Aug. 19 (M.L.B.) ; female, Steep Holm, Oct. 12, 14 (Res. Stn.) ; single birds, Sand Point, Oct. 26 and Woodspring Bay, Dec. 27 (T.B.S.).

KESTREL *Falco tinnunculus*

S. Single bird, Steep Holm, Mar. 18 ; one flying east over the island, Oct. 12 (Res. Stn.).

RED-LEGGED PARTRIDGE *Alectoris rufa*

G. Three, nr. Codrington, Apr. 27 (R.H.P.).

S. Pair, Uphill, Weston-super-Mare, Apr. 1, 9 and single bird on 10th (R.A.). One heard, Sand Point, Apr. 13 ; two, Brean Down, Sept. 14 (R.A.), Nov. 30 (E.G.H.).

QUAIL *Coturnix coturnix*

G. Two, calling, Marshfield, June 12 (B.K., G.S.).

WATER RAIL *Rallus aquaticus*

S. One, Sand Bay, Mar. 9 ; two, perhaps three, heard, same place, Dec. 7 (R.A.) and one, Dec. 13, 14, 25 (R.A., T.B.S.). Single birds, Chew Valley res., Mar. 30 (T.D.H.M. *et al.*), Aug. 25 (R.J.L.) ; and juvenile, same place, Dec. 7 (B.K.). Two flying over reeds, Clapton Moor, Apr. 12 (H.W.N.). One, nr. Abbots Leigh, Dec. 30 (J.G. per W.A.H.).

COOT *Fulica atra*

S. Reservoir records include : 1,900, peak total, Cheddar, Jan. 19, decreasing to 310 by end Mar. ; autumn counts, same res., less than 1,000 until Dec. (J.A.McG.) ; *c.* 1,450, Dec. 7 (P.J.C., M.A.W.) and at least 1,600 on 28th (J.A.McG.) ; 260, Barrow Gurney, Jan. 19 (G.E.C.) ; 450, Blagdon, Feb. 6 (G.C.B., S.I.B.) and 525, Aug. 4 (P.J.C., M.A.W.) ; and 1,260, Chew Valley, Feb. 16 (G.C.B., S.I.B.).

OYSTERCATCHER *Haematopus ostralegus*

G. Single bird, R. Avon, Sea Mills, Jan. 12 (W.A.H.) ; two, nr. Purton, Aug. 28 (P.J.O.).

S. 157, Weston Bay, Jan. 10, and 147, Dec. 14 (R.A.) ; up to 70, Sand Bay, Oct. 19–Dec. 14 (R.A., T.B.S.). Four, Steep Holm, Mar. 16, May 4, and five on landing beach, Oct. 14 (Res. Stn.); three, St. George's Wharf, Portbury, Sept. 14 (W.A.H.). One, Chew Valley res., Mar. 16 (G.C.B., S.I.B.); four, same place, Aug. 3 (W.A.H., T.D.H.M., J.A.F.W.) and six on 28th (B.C.P., E.M.P.). Two in flight high above Cheddar res., Aug. 3 (P.J.C., M.A.W.); bird, dead some weeks, same res., Sept. 2 (W.L.R.).

Ringed Plover *Charadrius hiaticula*

G. 70–80, Severn Beach, Aug. 27 (H.W.N., M.A.W.).

S. Up to 75, Weston Bay, Jan. 27–Feb. 19, and 78, Oct. 28 (R.A.); 120, Sand Bay, May 20; 100, Aug. 4 and very large counts of 450, Aug. 14, and 350 on 31st; max. of 16, same place, Oct. to end Dec. (T.B.S.). Records from Chew Valley res. include: six, May 31 (B.K.); up to 16, Aug. 1–Sept. 14 (various observers); single bird, Cheddar res., Apr. 4 (G.S.) and four, May 3 (W.A.H.).

Little Ringed Plover *Charadrius dubius*

S. One, Chew Valley res., Aug. 7, 8 (S.G.M.)—full details supplied.

Grey Plover *Charadrius squatarola*

S. Two, Kingston Seymour, Jan. 26 (D.A.H., T.D.H.M. *et al.*); six, Woodspring Bay, Apr. 4; one in summer plumage, May 26; two, same place, July 1, Nov. 30; and single birds, Sand Bay, Mar. 16, Aug. 14 (T.B.S.).

Golden Plover *Charadrius apricarius*

S. 141, Marksbury, Jan. 19 (P.J.C., M.A.W.), and 132, Apr. 13 (R.J.L.); 66 in flight, Queen Charlton, Nov. 6 (S.I.B.); 87, Lulsgate aerodrome, Nov. 23 (P.J.C., M.A.W.). Few coastal records—max. of 40, Sand Bay, Dec. 21 (R.A.).

Dotterel *Charadrius morinellus*

S. Two, Sand Point, Sept. 5 (T.B.S.)—conclusive details supplied.

Turnstone *Arenaria interpres*

G. Counts at Severn Beach include: 189, Feb. 27; at least 203, Mar. 29; and *c.* 120, Dec. 27 (W.A.H., T.D.H.M.). Fourteen, New Grounds, May 9 (M.D.).

S. One, Chew Valley res., May 29 (S.E.C., W.A.H.); five, two in summer plumage, Aug. 10 (B.K., G.S.); one, same place, Aug. 16, 20 (S.E.C., M.G.W.). Single birds, Sand Bay, July 19, Aug. 17 (R.A.).

GREAT SNIPE *Capella media*

G. One, New Grounds, Jan. 28, flushed several times by B.K. who has supplied a detailed description which includes: large amount of white at sides of tail, rather slow, silent flight, comparative tameness and large size.

JACK SNIPE *Lymnocryptes minimus*

S. Single bird, Chew Valley res., Nov. 29 (B.K.) and two, Dec. 7 (S.E.C.).

WOODCOCK *Scolopax rusticola*

G. One, Westerleigh Plantation, Mar. 9, 16; bird shot, same place, Dec. 27 (J.A.P.). Single birds, Purton, Apr. 3 and Bournstream, nr. Wotton-under-Edge, Dec. 12 (D.B.P.S.).

S. One, Uphill, Mar. 3 (R.A.) and Newton Park, Apr. 4 (R.J.L.).

CURLEW *Numenius arquata*

G. 170, Hallen Marsh, Jan. 12 (K.B.Y.); 243, Severn Beach, Feb. 12 (W.A.H.).

S. Nest found with two eggs, Walton Moor, nr. Clevedon, May 3, by R.A. provides the first conclusive evidence of breeding in the District since 1925—cf. *Proc. B.N.S.*, 1947, p. 255.

WHIMBREL *Numenius phaeopus*

G. and **S.** Frequently noted at coastal localities during spring passage.

S. Inland records: two or three, Charlcombe, Bath, Apr. 27–30 (C.R.S.); 26, Nailsea Moor, Apr. 27; 54, Kenn Moor, Apr. 29 (W.A.H., T.D.H.M.); at least 25, same place, May 10 (R.A.). Two, Chew Valley res., May 8, and 12, Aug. 10 (T.B.S.); five in flight, Cheddar res., May 10 (W.A.H.).

BLACK-TAILED GODWIT *Limosa limosa*

G. Twenty, New Grounds, Aug. 15 (M.D.); 12 on 16th, and 18, Sept. 6 (H.J.B.).

S. Three, Weston Bay, Mar. 25 (R.A.) ; five, Sand Bay, Aug. 14 (T.B.S.). Single birds, Chew Valley res., Mar. 31 (S.E.C., M.G.W.), June 4 (W.A.H.), Aug. 2–16 (B.K., W.L.R. *et al.*).

BAR-TAILED GODWIT *Limosa lapponica*

G. Five, New Grounds, May 8 (H.J.B.), and two, Oldbury-upon-Severn, Oct. 18 (H.W.N.).

S. Single birds, Weston Bay, Apr. 15–17 (R.A.) and Yeo Estuary on 29th (W.A.H.).

GREEN SANDPIPER *Tringa ochropus*

G. Single birds, New Grounds, Sept. 15 (M.D.) and R. Frome, Yate, Dec. 27, 28 (J.A.P.).

S. Few spring records. Single birds, Blagdon res., Apr. 6 (P.J.C.) ; Chew Valley res., Apr. 6, 13 (G.C.B., S.I.B., B.K.) and Kenn Moor on 15th (H.W.N.). Frequently reported, Chew Valley res., July 3–Sept. 27 (various observers) with max. of 17, July 19 (P.J.C.) and 15, Aug. 24 (B.K.) ; three present, Oct. 25, and one, Nov. 9 (S.E.C.). One, Chew Magna res., July 19 (P.J.C.) and Cheddar res., Nov. 16, 30 (W.A.H., J.A.McG.), Dec. 14 (J.A.McG.). Single birds, Yeo Estuary, Aug. 26 (W.L.R.) ; Bathford, Sept. 9 (R.J.L.) ; Old Mixon, Weston-super-Mare, Oct. 21 (R.A.) ; Woodspring Bay, Nov. 16 ; and Wick St. Lawrence on 30th (T.B.S.).

WOOD SANDPIPER *Tringa glareola*

S. One, Chew Valley res., Aug. 17 (G.C.B., S.I.B.), Sept. 3 (B.K., G.S.) ; two, same place, Sept. 6, 20 (T.B.S., G.S.).

COMMON SANDPIPER *Tringa hypoleucos*

S. Birds possibly wintering : one, Chew Valley res., Jan 12 (J.A.McG.), Dec. 18 (A.G.D.) ; two, R. Avon, Pill, Nov. 9 (P.J.C.); one, Woodspring Bay, Nov. 16 (T.B.S.). Twenty, Cheddar res., Apr. 27 (J.A.McG., M.G.W.) ; 13, Chew Valley res., Aug. 24 (B.K.) and 15, Sept. 8 (M.G.W.) ; 12, Sand Point, July 23 (T.B.S.).

REDSHANK *Tringa totanus*

S. Max. coastal counts : *c.* 200, Sand Bay, July 19, Aug. 15, Nov. 30 (R.A., T.B.S.) ; and 294, Axe Estuary, Oct. 28 (W.L.R.). Breeding season records are of : five pairs, Yeo Estuary area, end May (J.D.R.V.) ; two pairs, one with small youngster, Kewstoke, May 26 (T.B.S.); three, possibly four, pairs, Chew Valley res. during May (P.J.C. *et al.*), and two pairs, each with two young, same res., June 19 (B.K., G.S.).

Spotted Redshank *Tringa erythropus*

S. Chew Valley res.: one, Aug. 17 (G.C.B., S.I.B.); three, Aug. 20 (M.G.W.), 24 (P.J.C., B.K., M.A.W.); two, Sept. 13 (S.E.C., J.A.McG.), and one on 20th (S.E.C.,G.S.). Single bird, Woodspring Bay, Sept. 7 (T.B.S.).

Greenshank *Tringa nebularia*

G. One, Oldbury-upon-Severn, Aug. 15 (T.D.H.M.); two, New Grounds, Aug. 27 and single bird, Sept. 15 (M.D.).

S. One, Chew Valley res., May 3, 8, 10 (P.J.C., S.E.C., R.F.W.) and up to seven, same place, July 17–Oct. 2 (various observers). Four, Cheddar res., May 4 (B.K., J.A.McG.); one, July 6, 13, and three on 17th (B.K.). Single birds, Sand Bay, Aug. 3–Sept. 6 (T.B.S.); St. George's Wharf, Mouth of R. Avon, Aug. 26 (W.A.H., J.A.F.W.); and Uphill, Sept. 13 (R.A.).

Knot *Calidris canutus*

G. At least 300, Severn Beach, Feb. 12 (W.A.H., T.D.H.M.); 25, New Grounds, May 8 (H.J.B.).

S. Approx. 60, Weston Bay, Jan. 20 (R.A.) and 32, Dec. 6 (M.L.B.). One in summer plumage, Sand Bay, July 15; 34, same place, Aug. 31 (T.B.S.) and 168, Sept. 13 (R.A.). Single bird, Chew Valley res., Nov. 30 (S.E.C., P.T., N.W.).

Little Stint *Calidris minuta*

S. One, in summer plumage, Sand Bay, May 20–22 (T.B.S.).

Dunlin *Calidris alpina*

G. 850, Oldbury-upon-Severn, Mar. 15 (T.D.H.M.).

S. Totals from Weston Bay–Sand Bay area include: 1,800, Jan. 4 (R.A.); 2,000, May 9, 16; and 1,000, July 28, Dec. 6 (R.A., T.B.S.). Reservoir records include: single bird, Blagdon, Apr. 3 (W.L.R.); four, Cheddar, Apr. 26 (M.G.W.); six, Chew Valley, May 3, and ten, Aug. 10 (B.K.); two, Barrow Gurney, Oct. 19 (W.A.H.).

SANDERLING *Crocethia alba*

S. Reported from Weston Bay–Sand Bay area only—single birds, Feb. 23, Apr. 17 ; up to 25, May 8–22 ; and up to five, July 28–Sept. 12 (R.A., M.L.B., T.B.S.).

RUFF *Philomachus pugnax*

G. Thirteen, New Grounds, Sept. 17 (M.D.) ; six, Sept. 20 (H.J.B.) and five on 21st (P.J.O.).

S. Recorded at Chew Valley res. only : one, sometimes two, Aug. 2–Sept. 5 (various observers) ; five, Sept. 6 (T.B.S.) ; eight, Sept. 13 (J.A.McG, M.G.W.), 14 (G.C.B., S.I.B.) ; and six on 26th (G.S.) ; two, Oct. 2 (G.C.B., B.C.P. *et al.*).

GREY PHALAROPE *Phalaropus fulicarius*

S. One, nr. main dam, Chew Valley res., Oct. 5 (D.A.W., R.F.W.).

GREAT BLACK-BACKED GULL *Larus marinus*

S. Twenty-two (14 ads.), Axe Estuary, Feb. 9, and 20 at roost, Mouth of R. Avon, Nov. 9 (P.J.C.).

LESSER BLACK-BACKED GULL *Larus fuscus graellsii*

S. Some 30–50 pairs of *L. fuscus* and *L. argentatus* attempted to breed on the Denny Island, Chew Valley res., but eggs systematically collected by B.W.W. Co. staff and only two young seen : no evidence as to proportions of species (Eds.). Roosting again noted, same place—565, Aug. 14 (B.K., G.S.) ; 150, Dec. 13 (B.K.). Flock of 158 on flooded pasture, Midford, nr. Bath, Oct. 12 (R.J.L.).

SCANDINAVIAN LESSER BLACK-BACKED GULL *Larus fuscus fuscus*

G. One, apparently this race, New Grounds, Jan. 10 (B.K.).

HERRING GULL *Larus argentatus*

S. Only two roost counts from Chew Valley res.—210 immatures, May 11 and gathering of 725 adults in late afternoon, Dec. 13 (B.K.). Adult ringed, Steep Holm, 7/4/56, found dead nr. Looe, Cornwall, 5/1/59 (Res. Stn.).

LITTLE GULL *Larus minutus*

S. First-year bird reported, Chew Valley res., Dec. 1957, remained till Mar. 23 (various observers). Another, Cheddar res., Feb. 16–Mar. 23 (D.A.H., J.A.McG. *et al.*). Single juveniles, Cheddar res., Aug. 24 ; Chew Valley res., Sept. 3 (B.K., G.S.) and one found dead on 8th (S.E.C.).

BLACK-HEADED GULL *Larus ridibundus*

S. Approx. 14,750 at roost, Mouth of R. Avon, Feb. 18 (P.J.C.). Max. roost count from Chew Valley res.—at least 800, Dec. 13 (B.K.).

KITTIWAKE *Rissa tridactyla*

G. Adult, Severn Beach, Aug. 27 (H.W.N., M.A.W.).

S. Remains of first-year bird in tide-wrack, nr. Yeo Estuary, Jan. 19 (P.J.C., M.A.W.). Spring records all of first-year birds : two in flight, Cheddar res., Apr. 13 (J.A.McG.) ; remains of one, Steep Holm, May 2 (Res. Stn.) ; and one in flight, Sand Bay on 20th (T.B.S.). Autumn records : juvenile, Cheddar res., Aug. 3 (P.J.C., M.A.W.), 7 (W.A.H.) ; and adult, Chew Valley res. on 24th (P.J.C., M.A.W.). Seaward movement noted off Steep Holm, Oct. 13, when at least sixteen adults seen in afternoon, and a further eight on similar course the following day. Birds evidently on redetermined passage after being swept up-Channel in early hours of Oct. 13 by strong S.W. winds which had suddenly increased to gale force between 2400 and 0600 G.M.T. and had subsequently dropped to about 20 m.p.h. (Res. Stn.).

BLACK TERN *Chlidonias niger*

G. Three over estuary, New Grounds, Sept. 8 (M.D.).

S. Only two spring records—70, Chew Valley res., May 1 (D.M.C.) and four, May 4 (B.K.). Return passage from mid-July to mid-Oct. with peak in third week August. Twelve, Chew Valley res., July 19, Aug. 11 and smaller numbers to 17th ; *c.* 80, same place, Aug. 18 ; 25 or 26 from 20th to 24th, with 39 on 25th and min. of 50 on 28th ; *c.* 30, Aug. 30 but only two on 31st ; up to six in Sept. and one, Oct. 12 (various observers). Reports from Cheddar res. include : 12, Aug. 10 (J.A.McG.), Sept. 27 (M.G.W.); five, Oct. 5 (J.A.McG.) and very late record of one, Nov. 1 (S.E.C., M.G.W.) ; while at Blagdon res. species noted only in period mid-Sept. to early Oct. with max. of ten, Sept. 28 and seven, Oct. 5 (T.B.S. *et al.*).

COMMON TERN *Sterna hirundo* ARCTIC TERN *Sterna macrura*

S. One spring record, a single bird, Cheddar res., May 15 (W.L.R.). Autumn passage lasted from July 6 to Oct. 12, with movements noted at Cheddar and Chew Valley resrs., Aug. 10 and 24—majority thought to be *hirundo*. Chew Valley records: 113—most arriving during afternoon, Aug. 10 (B.K., G.S., S.S.); up to 11, Aug. 14–23; 23 (+), Aug. 24—arriving during day (P.J.C., M.A.W.) and 57 on 27th (W.A.H.); 29, Sept. 6 (T.B.S.), and up to four, Sept. 8–25 (various observers). Very few noted, Cheddar res., except for parties of 76, Aug. 24 (B.K.) and *c.* 25, Sept. 27 M.G.W.). Max. of five, Blagdon res., Sept. 28, Oct. 5 (T.B.S.).

LITTLE TERN *Sterna albifrons*

S. One over R. Avon, nr. Bath railway station, Sept. 7 (R.J.L.).

SANDWICH TERN *Sterna sandvicensis*

S. One, Yeo Estuary, May 30 (J.D.R.V.).

BRIDLED TERN *Sterna anaethetus*

S. Adult in autumn moult found dead on beach, Sand Bay, Oct. 17 (M.A.W.). Identification confirmed by the British Museum (Natural History) and the Editors of *British Birds*. Fourth record for the British Isles and first for Somerset—cf. *Report on Somerset Birds*, 1958.

BARN OWL *Tyto alba*

G. Single birds, Coalpit Heath, Mar. 18, Apr. 16 (J.A.P.); Hallen Marsh and nr. Avonmouth, Apr. 7 (H.W.N.); Cattybrook, May 31 (P.J.C.); and frequently at Westerleigh, nr. Yate, Sept.–Dec. (J.A.P.).

S. Only one nest found, pair rearing two young at Worle (C.H., H.G.H.), but birds noted in breeding season at Bourton Combe, Walton Moor, Priddy, and Blagdon and Chew Valley resrs. (various observers).

SHORT-EARED OWL *Asio flammeus*

S. One, hunting over rough pasture on coast, nr. Kingston Seymour, Nov. 16 (P.J.C.).

NIGHTJAR *Caprimulgus europaeus*

G. Pair, Michael Wood, Tortworth, throughout summer; single bird, Waterley Bottom, Wotton-under-Edge, July 22, 23 (D.B.P.S.).

SWIFT *Apus apus*

S. Two or three with Martins and Swallows, Cheddar res., Apr. 18, and *c.* 15 on 26th (M.G.W.). Party of 20 on migration passing N.E. over Blagdon res., Apr. 24 (G.S.). Well over 1,000, Chew Valley res., May 10 and at least 1,000, Aug. 4 (P.J.C.) ; 200–300, same place, Aug. 12, 13 (S.G.M.) and 170 passing over reservoir on 16th (B.K.). Late records of four, Chew Valley res., Sept. 8 and one, Cheddar res. on 20th (M.G.W.).

KINGFISHER *Alcedo atthis*

G. Nest found, R. Frome, Chipping Sodbury, May 30 (Jnr. Sect.). Present on R. Boyd, Wick, throughout year and adult seen feeding juvenile in July (D.R.H.). Single birds on R. Trym, Feb. 18, Apr. 22, 24 (H.W.N.) and R. Frome, Stapleton, various occasions during year (C.H., H.G.H.).

S. Bred successfully on Land Yeo river, Flax Bourton (per J.V.) and R. Axe, nr. Wookey Hole (J.A.McG.). Other breeding season records from Blagdon, Chew Valley and Litton resrs., Hunstrete and Newton Park lakes, and along R. Avon from Keynsham to Bath (various observers). One, nr. mouth of R. Yeo, May 3 (J.D.R.V.).

HOOPOE *Upupa epops*

G. One in field, Lower Wick, nr. Dursley, Apr. 22 ; another in school grounds, Alderley, nr. Wotton-under-Edge, May 4 (D.B.-P.S.).

S. Remains of one found, Cheddar res., Apr. 17 (D.A.W., R.F.W.). One shot (by accident !), Nailsea Moor, Nov. 12—remains sent to City Museum, Bristol (per J.H.S.).

LESSER SPOTTED WOODPECKER *Dendrocopos minor*

G. Single birds, Yate Rocks, Apr. 13 (J.A.P.) ; Red Wood, nr. Purton, Apr. 16, 20 (D.B.P.S.) ; Thornbury, Aug. 2 (T.D.H.M.) ; and Little Stoke on 6th (H.H.D.).

S. Dead adult by roadside, Uphill, Apr. 18 (R.A.), and single birds, Saltford, July 21 (B.K.), Aug. 14 (B.K., G.S.) and Sand Point, Aug. 10 (T.B.S.).

SWALLOW *Hirundo rustica*

S. Approx. 200 roosting in reedbed, Clapton Moor, Apr. 23 ′H.W.N.) but none on 25th (M.A.W. *et al.*).

Sand Martin *Riparia riparia*

S. Breeding records : 30–50 pairs in drainage pipes of retaining walls, Messrs. Fry's Chocolate Factory, Keynsham (per P.J.C.) ; three pairs in similar sites in railway banks, Bristol—two nr. Parson St. Station (R.A., S.M.T.), one nr. Temple Meads Station (R.A.) ; 4–6 pairs, Saltford and 4 pairs in bank of R. Avon 1 mile up-stream (P.T.S.).

Golden Oriole *Oriolus oriolus*

G. Loud musical and far reaching call notes heard by B.K. in Blaise Castle Wood, July 5, were considered to be those of a Golden Oriole. The bird could not be traced subsequently.

Raven *Corvus corax*

G. Pair, Old Decoy Wood, nr. Purton, several dates in Mar. and Waterley Bottom, nr. Wotton-under-Edge on 17th (D.B.P.S.).

S. No evidence of successful breeding, and although 2 or 3 young in nest, Brean Down, Apr. 25, none seen subsequently (R.A., W.L.R., T.B.S. *et al.*). Pair roosting in Town Quarry, Weston-super-Mare, July–Oct., possibly adults from Brean Down (R.A.)—cf. *Proc. B.N.S.*, 1957, p. 371.

Carrion Crow *Corvus corone*

S. Single birds off Steep Holm, May 4, June 30 (Res. Stn.).

Rook *Corvus frugilegus*

S. Solitary nest on pylon, Uphill, Mar. 21 but destroyed by 27th (R.A.) ; another in same vicinity, Apr. 29 (W.L.R.).

Jay *Garrulus glandarius*

S. One watched burying object, possibly oak-apple, nr. Cheddar res., Dec. 13 (B.K., P.T.)—cf. *Brit. Birds*, LI, pp. 500–502.

Blue Tit *Parus caeruleus*

S. Thirteen trapped, Steep Holm, Mar. 14–19 (Res. Stn.)—possibly overwintered, as two had been ringed on Island, Oct. 1957.

Coal Tit *Parus ater*

S. Three, Steep Holm, Mar. 14–19 (Res. Stn.).

Dipper *Cinclus cinclus*

G. Only records—single bird seen on three occasions, Yate, end Apr. to mid-May (J.A.P.), and one on weir, R. Boyd, Wick, in July (D.R.H.).

RING OUZEL *Turdus torquatus*

S. Seven (5 males, 2 females), Crook Peak, Apr. 8 (R.A.).

WHEATEAR *Oenanthe oenanthe*

S. Pair bred successfully, Wavering Down; adults with one young, and second pair present, June 8, which apparently did not breed (P.J.M.N.). At least seven of the larger "Northern" form on coast, nr. Kingston Seymour, Sept. 14 (P.J.C.) and three, Brean Down, Oct. 11 (B.K.).

BLACK REDSTART *Phoenicurus ochruros*

G. One male, Severn Beach, May 4 (G.C.B., S.I.B.).

S. Single male, Sand Bay, Apr. 13 (R.A.). Single females or immatures, Sand Point, Oct. 26 (R.A., T.B.S.), Nov. 14 (J.A.McG.); Uphill, Nov. 9 (R.A.); Brean Down, Nov. 29 (T.B.S.); and adult male, same place, Dec. 7 (P.J.C., M.A.W.).

GRASSHOPPER WARBLER *Locustella naevia*

S. Seven males located, Walton Moor, mid-May (P.J.C.) and three, Wrington Warren (C.G.). Other breeding season records from Burrington, Backwell Hill, Claverton, Leigh Woods and Brean Down (P.J.M.N., U.S. *et al.*).

REED WARBLER *Acrocephalus scirpaceus*

S. Three singing males, Newton Park Lake, June 29 (R.J.L.) and two or more, Chew Valley res., July 3 (B.K.,G.S.).

GOLDCREST *Regulus regulus*

S. Three, Steep Holm, Oct. 11–14 (Res. Stn.).

PIED FLYCATCHER *Muscicapa hypoleuca*

G. Single male by R. Trym, Sea Mills, Bristol, Apr. 21 (H.W.N.) and single females, Wick, Apr. 26, 27 (D.R.H.), Brandon Hill, Bristol, May 9 (P.J.M.N.). One, female or immature, Wick Court, Sept. 7 (D.R.H.).

S. A male, Wraxall, Apr. 27 (R.G.H.).

ROCK PIPIT *Anthus spinoletta petrosus*

S. Breeding population of six pairs, Sand Point and adjoining cliffs towards Woodspring (T.B.S.). Inland records, presumably of this race: one, with party of nine Water Pipits, Chew Valley res., Apr. 3 (B.K.), 4 (P.J.C., G.S., M.A.W.) and another, Dec. 5 (M.A.W.); two, Cheddar res., Nov. 20 (G.S.).

WATER PIPIT *Anthus spinoletta spinoletta*

S. One, Clevedon, Mar. 16 (B.K., S.R.). Party of six, Chew Valley res., Mar. 31 (S.G.M.) and nine at same spot, Apr. 3, 4 with smaller numbers (max. of 5) to Apr. 12 (D.M.C., S.E.C., B.K., G.S. *et al.*). Single birds also reported from Sand Point, Apr. 12 (R.A.) and Chew Valley res., Nov. 29 (B.K.).

PIED WAGTAIL *Motacilla alba yarrellii*

S. Approx. 150–225 roosting in reedbed, Chew Valley res., Sept. 11 (G.H.H., L.S.).

GREY WAGTAIL *Motacilla cinerea*

S. A rather unusual record is that of a party of seven, Sand Bay, Sept. 7 (T.B.S.).

YELLOW WAGTAIL *Motacilla flava flavissima*

S. Forty roosting in *Spartina*, Sand Bay, Sept. 3 (T.B.S.). Some 50–75 roosting with Pied Wagtails in reeds, Chew Valley res., Sept. 11 (G.H.H., L.S.).

WAXWING *Bombycilla garrulus*

G. One seen at close range, Aust, Jan. 14 (H.W.N.). Two in garden, Fishponds, Bristol, Feb. 8 (per P.F.B.).

WOODCHAT SHRIKE *Lanius senator*

G. Adult on telephone wires by roadside, nr. Dursley, May 27, was identified by M.H.P. who has supplied a detailed plumage description. Features noted include the compact, heavy-headed appearance ; chestnut crown and nape ; black upper parts with well-marked white scapulars ; black tail with white outer tail-feathers ; very white under-parts ; and the stout, slightly hooked, shrike-like bill. First record for the District for over 70 years—cf. *Proc. B.N.S.*, 1947, p. 237.

RED-BACKED SHRIKE *Lanius collurio*

S. Pair attempted to breed, nr. Kewstoke, but nest eventually deserted (R.A.). Single male, Redcliffe Bay, June 17 (K.B.Y.).

STARLING *Sturnus vulgaris*

S. Large increase noted at Newton St. Loe roost during Feb. (R.J.L.)—cf. *Proc. B.N.S.*, 1957, p. 374.

HAWFINCH *Coccothraustes coccothraustes*

G. Adult male in garden, Clifton, several occasions, Jan.–Feb., and party of five once in Feb. ; single male, same place, Nov. 10 (G.A.F.). One, New Grounds, June 8 (A.M.P.J., P.J.O.) and another, Coombe Hill, nr. Wotton-under-Edge, Oct. 10 (D.B.P.S.).

S. Pair seen frequently in garden, nr. Bath, Feb. 2–25 (C.N.V.). Single birds, Weston-super-Mare, Apr. 4 (R.A.), 7, 9 (P.F.).

SISKIN *Carduelis spinus*

S. Two, nr. Litton res., Jan. 19 (B.K.) and party of 15, Newton Park, Newton St. Loe, on 26th (A.C.G.). Two with other finches, Sand Bay, Oct. 26 (R.A.). Approx. 30, Wrington, Nov. 18 (E.G.H.).

REDPOLL *Carduelis flammea*

S. Three, nr. Litton res., Jan. 19 (B.K.).

CROSSBILL *Loxia curvirostra*

G. Three, Westonbirt Arboretum, Oct. 19 (D.B.P.S.).

S. Twelve, Faulkland, nr. Norton St. Philip, Oct. 18 (E.G.H.).

BRAMBLING *Fringilla montifringilla*

S. Two seen in flight over Steep Holm, Oct. 10—one later settled for a short time. First record for the Island (Res. Stn.).

CORN BUNTING *Emberiza calandra*

G. Eleven heard or seen, Marshfield, June 12 (B.K.). One heard, Mangotsfield, Aug. 10, 17—near site where small colony located in 1954 (R.H.P.).

S. One, Yoxter, Mendip, May 26 (P.J.C., M.A.W.).

CIRL BUNTING *Emberiza cirlus*

G. Single male, Penpole, nr. Shirehampton, Bristol, May 11 (K.B.Y.).

S. Breeding season records from Cheddar (at least 5 males located), around Bleadon and Hutton, Kewstoke, and the Wells area (R.A., J.D.R.V. *et al.*).

SNOW BUNTING *Plectrophenax nivalis*

G. Party of five, Severn Beach, Jan. 2 (G.H.). One, presumably a wild bird, in grounds of Woodfield Primary School, nr. Dursley, on the unusual date of May 6 (D.B.P.S.).

S. Single birds, Clevedon, Dec. 2 (W.S., M.W.), and Sand Bay on 25th (T.B.S.).

LEPIDOPTERA NOTES BRISTOL DISTRICT, 1958

By C. S. H. Blathwayt

A COLD spring was followed by a wet summer with few really fine days or warm nights. The autumn was perhaps a little better so far as weather was concerned.

The year was a bad one for both Butterflies and Moths.

The following records are my own, except when otherwise stated.

Argynnis aglaia Linn. (Dark Green Fritillary). A fine specimen of var. *charlotta* was taken by C. L. Bell in the Mendips in July.

Lycaena phlaeas Linn. (Small Copper). An unusual variety with dark forewings and transparent hindwings was taken by C. L. Bell in the Mendips in June.

Herse convolvuli Linn. (Convolvulus Hawk). One at light, Weston, September 16.

Cerura hermelina Goeze (*bifida* Hubn.) (Poplar Kitten). One at light, Weston, June 16.

Cerura furcula Linn. (Sallow Kitten). One at light, Weston, August 30.

Pseudoips bicolorana Fuessl. (*quercana* Schiff) (Scarce Silver-lines). Several at light, Weston, in July.

Apatele leporina Linn. (Miller). One at light, Weston, July 5.

Agrotis cinerea Hubn. (Light Feathered Rustic). At light, Weston, May 27 and June 5.

Agrotis trux Hubn. (*lunigera* Steph.) (Crescent Dart). Several at light, Weston, July and August.

Dasypolia templi Thunb. (Brindled Ochre). Three at light, Weston, October 17.

Hydraecia paludis Tutt (Saltern Ear). Several at light, Weston, in August.

Laphygma exigua Hubn. (Small Mottled Willow). Two at light, Weston, July 27 and August 27.

Cucullia absinthii Linn. (Pale Wormwood Shark). One at light, Weston, July 25.

Heliothis peltigera Schiff. (Dark Bordered Straw). Eight at light, Weston, May, June and September.

Bomolacha fontis Thunb. (Beautiful Snout). One at light, Weston, June 21.

Sterrha dilutaria Hubn. (*holosericata* Dup.) (Silky Wave). Fairly common Durdham Down, July 5.

Mysticoptera sexalisata Hubn. (*sexalata* Retz.) (Small Seraphim). One at light, Weston, June 29.

Rhodometra sacraria Linn. (Vestal.). One at dusk, Weston, September 14.

Plemyria bicolorata Hufn. (Blue-bordered Carpet). One at light, Weston, July 7.

Eupithecia distinctaria H.S. (*constrictata* Guen) (Thyme Pug.). One at light, Weston, July 7.

Selenia lunaria Schiff. (Lunar Thorn). One at light, Weston, June 8.

Cleora ribeata Clerck (*abietaria* Hubn.) (Satin Beauty). One at light, Weston, July 19.

Margaronia unionalis Hubn. (Scarce Olive-tree Pearl). Four at light, Weston, August, September and October.

STUDIES ON THE BIOLOGY OF THE BRISTOL CHANNEL

XIX

NOTES ON THE INTERTIDAL FAUNA OF SOME SANDY AND MUDDY BEACHES IN THE BRISTOL CHANNEL AND SEVERN ESTUARY

BY E. C. HADERLIE AND R. B. CLARK

IN the course of an investigation of the intertidal fauna of sandy beaches around the coast of south-western Britain during the autumn of 1958 we have had occasion to examine a number of beaches in the Bristol Channel area. The fauna of some of them has already been described in this series by previous investigators and we take this opportunity to supplement their observations and to comment on the present status of some members of the fauna. Attention has been directed primarily towards the occurrence and distribution of the polychaete family Nephtyidae and other animals in the sand have been noted only incidentally. Our observations on the beaches are therefore far from exhaustive. A full report of the investigation will be published elsewhere, but we include here observations of local interest. We are particularly indebted to Mr. R. Bassindale for his advice and assistance in many ways.

The beaches are taken in succession round the coasts under the names by which they are located on the map, Fig. 1.

THE MUMBLES. There is a shingle bank at H.W.M. ; the rest of the beach is composed of fairly coarse sand lying over clay. The beach derives some protection from south-westerly storms but is still relatively exposed and the substratum contains little silt or fine sand. The salinity of the sea, measured at low water, was 26.3‰. *Nephtys cirrosa* common in the lower half of the beach.

SWANSEA. Low sand dunes at H.W.M., the rest of the beach composed of coarse sand. Salinity 26.4‰. A small collection of *Nephtys* from this beach was kindly sent to us by Prof. E. W. Knight-Jones of University College, Swansea and we have since visited the beach and made additional collections. Both *Nephtys cirrosa* and *N. hombergi* occur in approximately equal numbers. This is very unusual and no other beach in the Bristol Channel

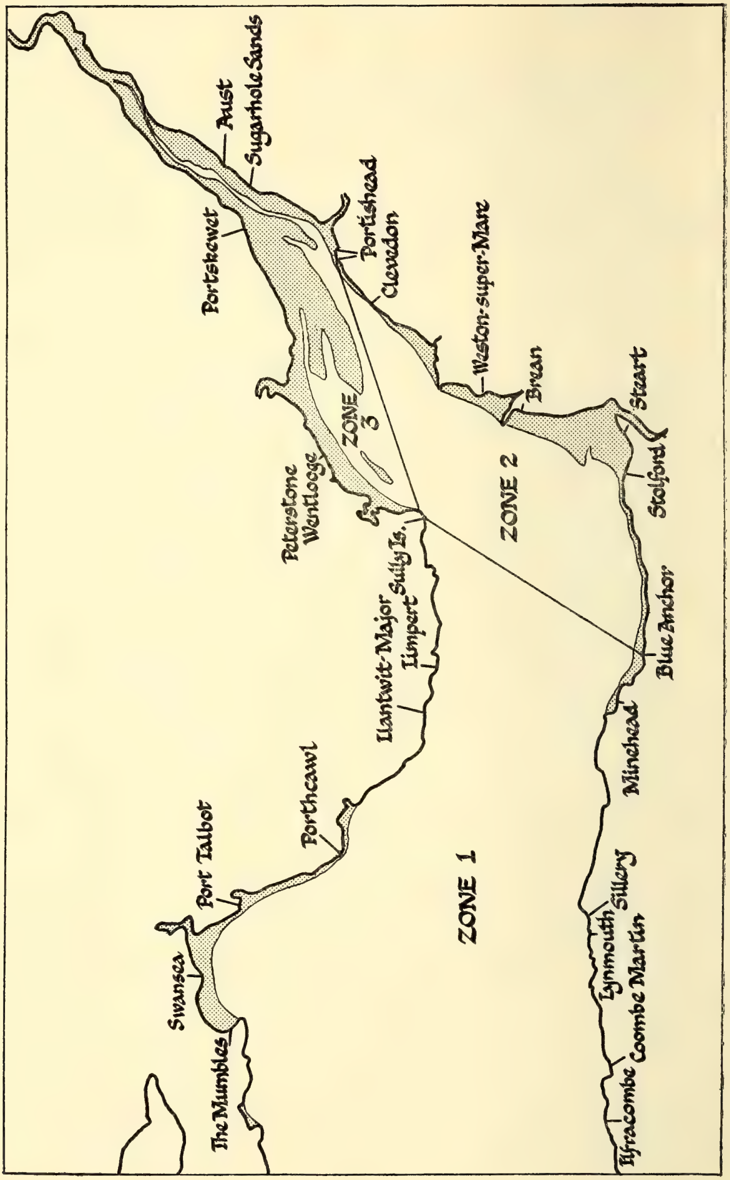

Aust
Sugarhole Sands
Portskewet
Portishead
Clevedon
Weston-super-Mare
Brean
Steart
Stolford
ZONE 3
ZONE 2
ZONE 1
Peterstone Wentlooge
Sully Is.
Limpert
Llantwit-Major
Blue Anchor
Minehead
Porthcawl
Port Talbot
Swansea
The Mumbles
Sillery
Lynmouth
Coombe Martin
Ilfracombe

Figure 1.—Map of the Severn estuary and Bristol Channel showing the stations at which collections have been made, the three zones into which this area may be divided, and intertidal sand and mud-banks (stippled).

has been found to contain both species. The only other beach on the coasts of South Wales and South-West England to contain both species in more or less equal proportions that we have discovered is at Torquay. The two species have the same intertidal distribution and both are distributed over the lower half of the beaches.

PORT TALBOT. Clean sandy beach exposed to heavy surf. The substratum is composed of coarse sand including numerous fragments of shell. Salinity 30.8‰. *Nephtys cirrosa* is fairly common around and below M.T.L. A single specimen of *Nephtys longosetosa* was found above M.T.L. This is an arctic, circumpolar species and is only rarely found on the western and southern coasts of Britain. Two specimens of the amphipod *Haustarius arenarius* were found near H.W.M.

PORTHCAWL. There is a shingle bank at H.W.M., the rest of the beach is composed of clean sand with some pebbles and numerous shell fragments. As at Port Talbot, the beach is exposed to heavy surf. Salinity 29.8‰. *Nephtys cirrosa* is fairly common around M.T.L. Three specimens of the spionid polychaete *Nerine cirratulus* were also found at M.T.L.

LLANTWIT MAJOR. The beach and its fauna were previously described by Purchon (1957). There is a shingle bank at H.W.M., the rest of the beach is rocky except for a strip of sand running across the beach to L.W.M. Salinity 30.0‰. Purchon recorded *Nephtys caeca* from this beach, but after an extended search we found only a few *N. cirrosa* in a few scattered areas at M.T.L. *Nephtys caeca*, like *N. longosetosa*, is an arctic species and has been recorded only occasionally and in small numbers around the south-western coast of Britain. It is most unlikely that a permanent colony exists in the Bristol Channel.

LIMPERT BAY. There is a shingle bank at H.W.M., the rest of the beach consists of boulders with areas of sand between them, becoming muddy towards L.W.M. Salinity 27.2‰. *Nephtys cirrosa* occurs in small numbers in the patches of sand at M.T.L. Single specimens of *Phyllodoce mucosa* and the ariciid polychaete *Scoloplos armiger* were collected with the *Nephtys*.

SULLY ISLAND. The beach and fauna were previously described by Purchon (1948). We have examined only the east side of the causeway where the substratum consists of pebble and gravel with some patches of sand. Particularly towards L.W.M. there is a deposit of mud over the sand. Purchon records *Nephtys* *cirrosa* from this area, but we failed to find any. The substratum contains more silt than is usual on beaches in which *N. cirrosa* occurs, but Sully Island represents the limit of its penetration into the estuary and so the species may be expected to fluctuate, being present in some years but absent in others.

PETERSTONE WENTLOOGE. The estuarine mud flats have been described in detail by Rees (1940) who also has an account of the macro- and microfauna, and Purchon (1948) gives some additional information about the fauna. Rees found *Nephtys* sp., this was undoubtedly *N. hombergi*, but neither Purchon nor we have found any in later examinations of the beach. Both Rees' and our own analysis of the substratum show that it is composed exclusively of silt and fine sand and that no particles in it are greater than 0.125 mm. in size. This is a finer substratum than *N. hombergi* usually inhabits and we suspect that the previous record of *Nephtys* from this beach refers to sporadic and temporary inhabitants. *Nereis diversicolor*, *Macoma balthica* and *Hydrobia ulvae* are the dominant members of the fauna, as Rees and Purchon previously noted.

PORTSKEWETT. Beach described by Purchon (1957). The greater part of the beach is composed of stiff mud with a few large boulders embedded in it. *Nereis diversicolor* is abundant in the mud. No *Nephtys* were found.

AUST. Estuarine mud flats lie at the foot of Aust cliff and some rock and debris from the cliff occupy the upper half of the beach. The mud is thick and densely populated by *Nereis diversicolor*.

SUGARHOLE SANDS. There is a shingle bank at H.W.M. Estuarine mud flats extend to L.W.M. and are populated by *Nereis diversicolor*.

ROYAL BEACH, PORTISHEAD. The upper part of the beach consists of boulders and loose rocks lying at the foot of a low cliff, with pebble and shingle between them. The lower part of the beach is composed of clean sand 6–8 ins. deep lying over clay. There is a considerable deposition of silt over the upper half of the beach where it collects in pockets between the rocks, especially towards Battery Point at the west end of the beach. On Battery Point itself mud fills the gullies between the rocks. The fauna was described by Purchon (1937), who described *Nephtys hombergi* as being numerous in the mud. This is evidently an error of transcription for *Nereis diversicolor*, which we found to be abundant in this environment. The mud is too fine and soft to be colonised by *Nephtys* and the only specimens we found were in the sandy strip at L.W.M.

KILKENNY BAY, PORTISHEAD. There is a shingle bank at H.W.M. and below this the upper half of the beach is composed of thick, sticky, estuarine mud dissected by drainage runnels. The lower half of the beach consists of a layer of sand from ½ to 2 ins. thick, over soft mud. At. L.W.M. there is a strip of harder substratum composed of alternating layers of compacted sand and mud. A small number of *Nephtys hombergi* was collected in the lower half of the beach. They are to be found chiefly in the superficial sandy layer and quite often lie at the interface between the sand and mud, though a few penetrate into the soft mud beneath. A few of these worms were also discovered in the compacted sand and mud at L.W.M. *Nereis diversicolor* is common in the upper half of the beach, but the mud in the lower half appears to be too fluid for them to construct their burrows and galleries in it and only a few are to be found there. They are very common under the loose stones which lie on the mud at the side of the beach near Battery Point. The amphipod *Corophium volutator* occurs in moderate numbers, chiefly in the upper half of the beach. *Macoma balthica* is relatively common in the softer mud.

CLEVEDON. A series of rocky reefs run across the beach from H.W.M. to L.W.M. Between them there are deposits of slimy mud. There is some gravelly sand below the sea wall at H.W.M. The fauna at Clevedon is an impoverished one (Bassindale 1943) and consists mainly of gastropods living on the rocks. We found no animals in either the mud or the gravel.

WESTON-SUPER-MARE. The upper half of the beach is composed of fairly clean sand, but lower down an increasingly thick layer of mud covers the sand, replacing it at L.W.M. *Nephtys hombergi* is common at the lower tidal level occupied by *Arenicola*, but does not extend far into the muddier part of the beach. *Macoma balthica* is widely distributed and although reported to be abundant by Bassindale (1940) empty shells were more numerous than living animals on 29th October 1958. A few *Corophium volutator* occur.

BREAN. The beach is sandy for about 400 yards from H.W.M., beyond this it becomes muddy. There is a shingle bank at H.W.M. The following animals are common in the sandy strip and show a distinct zonation at different tidal levels. *Bathyporeia pilosa*, reaching a maximum density of 5,000 per square metre, at the top of the beach. *Arenicola marina* forming a well-defined belt with a maximum density of 40 per square metre about 200 yards from H.W.M., *Nephtys hombergi* with a maximum density of 84 per square yard overlaps the *Arenicola* zone, but the worms are also found in the muddier sand about 400 yards from H.W.M. *Macoma balthica* is abundant (max. density about 250 per square metre) and is widely distributed over the beach. A few *Corophium volutata*, two *Nereis diversicolor*, and some unidentified nemerteans have also been found there.

STEART. Salinity 25.1‰. The entire area of Steart Flats is densely populated by *Nereis diversicolor*, the total population of which must be incredibly large. At Steart there is a 400 yard zone of *Spartina* at H.W.M. and small patches of sand lying over black mud between this and the mud flats. *N. diversicolor* occurs also in the sand.

STOLFORD. Salinity 25.1‰. There is a shingle bank at H.W.M. and, as at Steart, isolated patches of sand between the shingle and the mud flats. These contain a small number of *Arenicola marina* and some *Nephtys hombergi*. *Nephtys* does not occur on the mud flats.

BLUE ANCHOR. The beach is composed of coarse sand at H.W.M. grading into clean sand at L.W.M. and a layer of mud is deposited on the sand. Salinity 29.4‰. *Arenicola marina* is common in the upper half of the beach, *N. cirrosa* common at about M.T.L. A few *Nerine cirratulus* were also found. No *Nephtys hombergi* were found, though Bassindale (1940) records a single specimen.

MINEHEAD. Tongues of shingle run out across the beach, but there are two or three extensive areas of sand between them. Towards L.W.M. a thin layer of silt is deposited on the sand. Salinity 28.4‰. *Nephtys cirrosa* very common in association with *Arenicola marina* below M.T.L.

SILLERY SANDS, LYNMOUTH BAY. Most of the beach is rocky, but a narrow, clean sandy beach is exposed at low water. Salinity 33.6‰. No animals were found in the sand.

LYNMOUTH. Most of the beach is composed of rock and shingle, but below M.T.L. strips of coarse sand occur, mostly overlying rock. Salinity 30.6‰. No animals were found in the sand.

COMBE MARTIN. A small area of sand is exposed at low water, otherwise the beach is rocky. Salinity 21.9‰. A small number of *Arenicola marina* occur in one or two areas. The most numerous polychaete in the sand is *Scolelepis fuliginosa*. A small number of *Nephtys cirrosa* occur in association with *Scolelepis*.

Ilfracombe. The beach consists of reefs running out to L.W.M., with strips of coarse gravelly sand between them. Salinity 35·0‰. No animals were found in the sand.

DISCUSSION

The lower reaches of estuaries are characterised by a widely fluctuating salinity and for this reason we have not quoted salinities measured at stations upstream from Weston, where salinity fluctuations are slight (Bassindale 1943), nor above Sully Island. This is not to say that estuarine conditions do not prevail below Weston, for there is an extensive deposition of the silt that is carried down by the river as far as Stolford and to a diminishing extent even to Minehead. The continual deposition of silt and widely varying salinities render estuaries extremely difficult environments for animals to colonise, and the fauna is correspondingly impoverished, though those animals that can survive in them have little competition and usually occur in enormous numbers.

In the present investigation we have found *Nephtys cirrosa* to live only in marine beaches and it penetrates into the Bristol Channel only as far as Blue Anchor on the Somerset coast and Limpert Bay on the Welsh side. *Nephtys hombergi* on the other hand commonly occurs in the lower reaches of estuaries and has been found in this situation in the estuaries of the Tamar (Percival 1929, Spooner & Moore 1940), Exe (Allen & Todd 1902, Holme 1949), Salcombe (Allen & Todd 1900), and Mersey (Bassindale 1938) as well as the Severn estuary. It occurs between Portishead and Stolford and exceptionally to Blue Anchor, but Stolford probably represents the seaward limit of its intertidal range. Apart from an isolated record which presumably refers to this species, at Peterstone Wentlooge, it does not occur on the Welsh side of the estuary (Swansea, where a population of *N. hombergi* does exist, is so far removed from any influence of the Severn estuary that it can be ignored in this discussion). On the Welsh coast there is a sudden change from estuarine conditions such as occur above Avonmouth on the Somerset shore, to purely marine conditions and the change takes place a little west of Sully Island.

Why there should be such a transition zone between estuarine and marine conditions on the Somerset coast but not on the Welsh coast can be understood from a consideration of the pattern of salinity fluctuations, the nature of the substratum, and the configuration of the Channel and estuary.

The tidal and seasonal fluctuations in salinity at Aust is considerable and the salinity may fall to zero at low tide in late winter.

At Weston, the tidal fluctuation is about 6‰. The change in the pattern of salinity variation is probably fairly abrupt and is likely to occur at about Portishead or Avonmouth where the river channel narrows suddenly (Bassindale 1943a) and it is noteworthy that there is an abrupt impoverishment of the fauna upstream from Portishead. *Nephtys hombergi* is one of the species that cannot withstand the harsh salinity conditions that exist above Portishead. It is also excluded from very muddy beaches, so that it does not occur at Clevedon or on the Steart Flats because there is no suitable substratum, even though the salinity variations are tolerable at these places. *Nephtys cirrosa* on the other hand cannot withstand a salinity of less than about 26‰ and does not occur in sand that contains more than about 2% of silt. It is found from Ilfracombe to Blue Anchor where these conditions are satisfied.

Unfortunately we do not possess a comparable body of information about salinity fluctuations on the Welsh coast. But the salinity fluctuations in Cardiff roads are comparable to those at Weston (Rees 1939) and there is not likely to be a great difference between the Welsh and English shores of the Channel in this respect. The chief difference between the two coast lines is in the degree of exposure. The Welsh coast, from Swansea Bay to Limpert Bay and probably to Sully Island is exposed to south-westerly storms, and there is no deposition of silt on these beaches which have relatively coarse substratum and are inhabited by *Nephtys cirrosa*. Upstream from Sully Island, the northern coast is protected and suffers a heavy deposition of silt, so much so that *N. hombergi* is excluded from the stretch of the estuary it would normally occupy.

So heavy and continuous is the deposition of silt in estuaries that rocky shores are exceptional in them and animals that can live only on a solid substratum are unreliable indicators of different zones in the lower reaches of an estuary. Their absence may be dictated by low or fluctuating salinity or by the quantity of silt in the water, but is more often due to the simple lack of rocks, as Purchon (1948) remarked. Sand and mud banks, on the other hand, are always to be found in estuaries and at the mouths of rivers, and a number of animals living in them occur with sufficient regularity to serve as useful indicators of estuarine conditions. Only the commonest animals need be considered because other species may be rare, not because of the peculiar conditions in the estuary, but because the area is outside their normal geographical range. Although *Nephtys caeca* and *N. longosetosa* are normally found in marine habitats, no significance can be attached to specimens of these species having been found at Llantwit Major and Port Talbot because the entire south and west of the British Isles is unsuitable for these arctic worms.

Bearing these facts in mind, we can now recognise three distinct zones in the estuary and Channel.

1. Marine zone, where the salinity may be slightly reduced but does not fluctuate appreciably and where the deposition of silt is slight. The beaches are of clean sand (or of coarser substratum, or rock) and are inhabited by species such as *Nerine cirratulus* and *Nephtys cirrosa*. In the Bristol Channel this zone extends as far as Sully Island and Blue Anchor.

2. Transition zone, where the salinity is reduced and is subject to moderate seasonal fluctuation but slight tidal fluctuation. The deposition of silt may be heavy in sheltered places (e.g. Steart Flats) but beaches are generally composed of muddy sand, or sand at H.W.M. and M.T.L., grading into mud at L.W.M. *Nephtys hombergi* is a characteristic inhabitant of the muddy sand, *Nereis diversicolor* is numerous only where the deposition of silt is considerable. On the Somerset coast, this zone extends from Blue Anchor to Portishead. There is no comparable zone on the Welsh coast.

3. Estuarine zone, where tidal and seasonal fluctuations in salinity are great and silt is deposited. There are no sandy beaches. The mud flats are densely populated by *Nereis diversicolor*. This zone extends upstream from Sully Island and Portishead.

Some species are not reliable indicators of estuarine conditions although they may occur in appreciable numbers. *Arenicola marina*, for example, can withstand a considerable reduction in salinity and occurs in the Baltic and in most estuaries. However it also occurs on marine beaches and its distribution in estuaries seems to be dictated by the nature of the substratum.

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THE PLANT ECOLOGY OF THE GORDANO VALLEY

By A. J. Willis and R. L. Jefferies

INTRODUCTION

THE Gordano Valley, North Somerset, is a low-lying tract of land extending north-eastwards from Clevedon to the Severn estuary and the mouth of the River Avon. The valley, in some respects similar to the extensive flats of the Somerset Levels to the south-west, is separated from this low ground by a hill ridge east of Clevedon.

Much of the area carries fen vegetation and has long been known to support several plants of particular interest; records of occurrence have from time to time been given in these Proceedings. The two British species of *Cyperus*, *C. fuscus* and *C. longus*, both rare in this country, have been reported for the valley, but the latter became extinct about 1896 (White, 1912). Also almost certainly extinct, probably as a result of ditch-clearing and obliteration of its site by the dumping of rubbish, is the great fen sedge, *Cladium mariscus*, a plant characteristic of base-rich water, and once extending for about 100 yards on the south side of Walton Moor (White, 1920).

The ecological survey reported here resulted from a study of the vegetation of the valley from 1954 to 1958, and an attempt is made to describe the chief plant communities in relation to the major environmental factors operating. In particular, edaphic and climatic conditions have been investigated, since water levels, the mineral content of the water and the nature of the soils in the valley are all features likely to have considerable influences on the vegetation.

Attention is largely devoted to the part of the valley lying west of Clapton Lane; nearly all the semi-natural vegetation of the valley is in this area.

TOPOGRAPHY OF THE VALLEY

The Gordano valley is more or less wedge-shaped, and is about 5 miles long and approximately 1 mile wide over much of its length (Figs. 1 and 2). It is bounded by broken hill ridges which converge at East Clevedon where there is a narrow gap (just below 50 ft. O.D.) through which the road runs. The ridge bordering the south

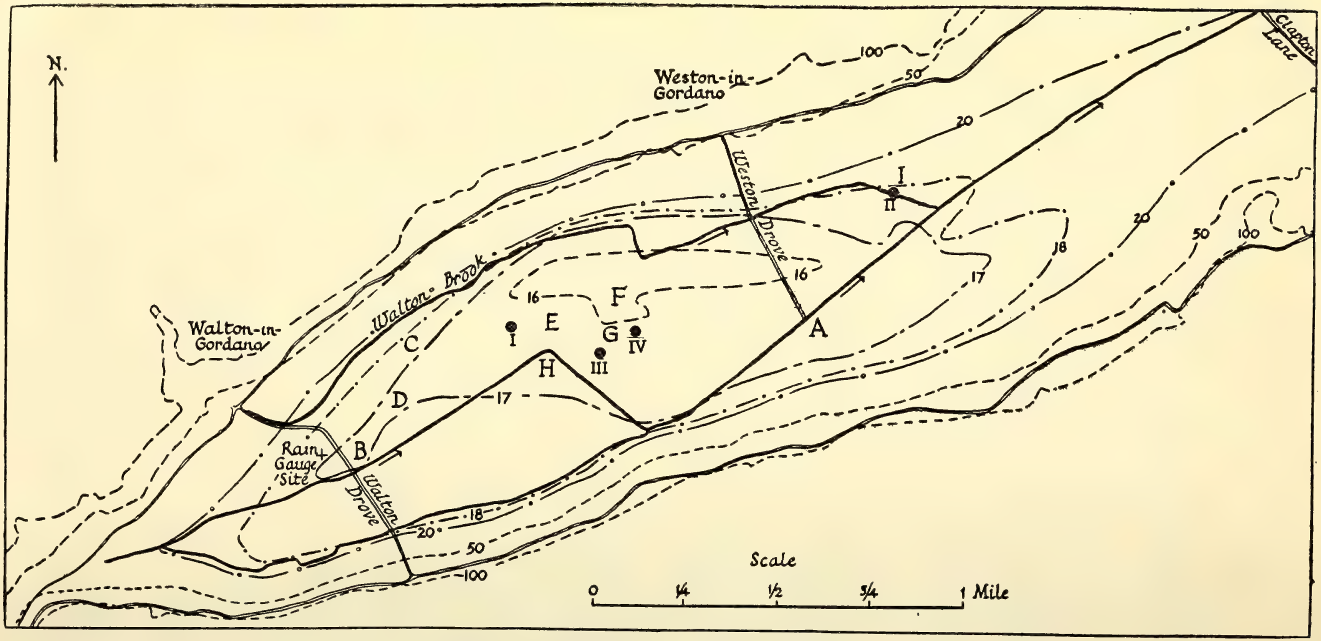
N.
Clapton Lane
Weston-in-Gordano
Walton-in-Gordano
Weston Drove
Walton Drove
Walton Brook
Rain Gauge Site
100
50
20
18
17
16
A
B
C
D
E
F
G
H
I
I
II
III
IV
Scale
0
¼
½
¾
1 Mile

FIG. 1. *Topography of the Gordano Valley*

Contours are given by broken lines for 100 and 50 ft. (from O.S. maps), and also approximately for 20, 18, 17 and 16 ft. O.D. Roads are shown by double lines, and drainage channels by thick lines, arrows indicating direction of flow. Sites I-IV, shown by ●, are positions where water level and pH measurements were made (see Fig. 3.) The letters A-I indicate the sites for which the vegetation is listed in Table 1.

side of the valley rises steadily in an easterly direction from approximately 300 ft. to 400 ft. O.D. Its north-facing concave slope is steep, especially at the west end of the valley. The north ridge, however, is lower, and breaks in its continuity occur at Walton-in-Gordano and at Weston-in-Gordano.

One of the most striking features of the topography of the valley is the small change in level from Walton Moor to Portishead. Much of the ground lies just below 20 ft. O.D. and, as shown in Fig. 1, the gradient is very slight. The contours given in Fig. 1 are derived largely from a recent survey made by means of a 6-inch levelling telescope and staff, and related to Ordnance Survey bench-marks. Distances were determined optically by the use of a telescope graticule. The contours for 100 and 50 ft. are taken from the Ordnance Survey 6-inch to 1 mile maps, Somerset Sheets I S.E., II S.W., IV N.W. & N.E. and V N.W. The land slopes down from the head of the valley to just under 16 ft. O.D. in the lowest parts of Weston Moor ; in this west end of the valley the top soil is of peat. To the east of Weston Drove the land rises two to three feet and here the peat is overlain by a layer of blue-grey clay of marine origin.

GEOLOGY

The geology of the valley is complex ; the chief features are shown in Fig. 2. Palaeozoic rocks, dipping away from the sea, form the ridges bounding the valley, the north ridge being composed of Old Red Sandstone overlain by Carboniferous Limestone, whereas the Clevedon–Bristol ridge to the south consists almost entirely of Carboniferous Limestone. The Devonian rocks, however, do not appear on the surface except at a few places, for example near Portishead. Dolomitic Conglomerate is banked up against these ridges and is overlain on both sides of the valley by Red Keuper Marl. Coal Measures, probably of the Pennant series, extend along the north-facing slope of the south ridge, and were once worked at Clapton-in-Gordano, giving coal of high sulphur content.

Quaternary deposits are well represented in the valley. Greenly (1922) and Palmer (1934) recognise aeolian sands in the East Clevedon gap which they consider to have been deposited there during a cold phase, but the authors have opposing views as to the source of this material. On the north slope at Weston-in-Gordano, marine Pleistocene deposits are present although no exposures are now visible. The deposits have recently been described by Ap-Simon and Donovan (1956), who tentatively correlate them with the " Main Monastirian " phase of the last Interglacial. Limnic muds occur below the peat of Weston and Walton Moors and are

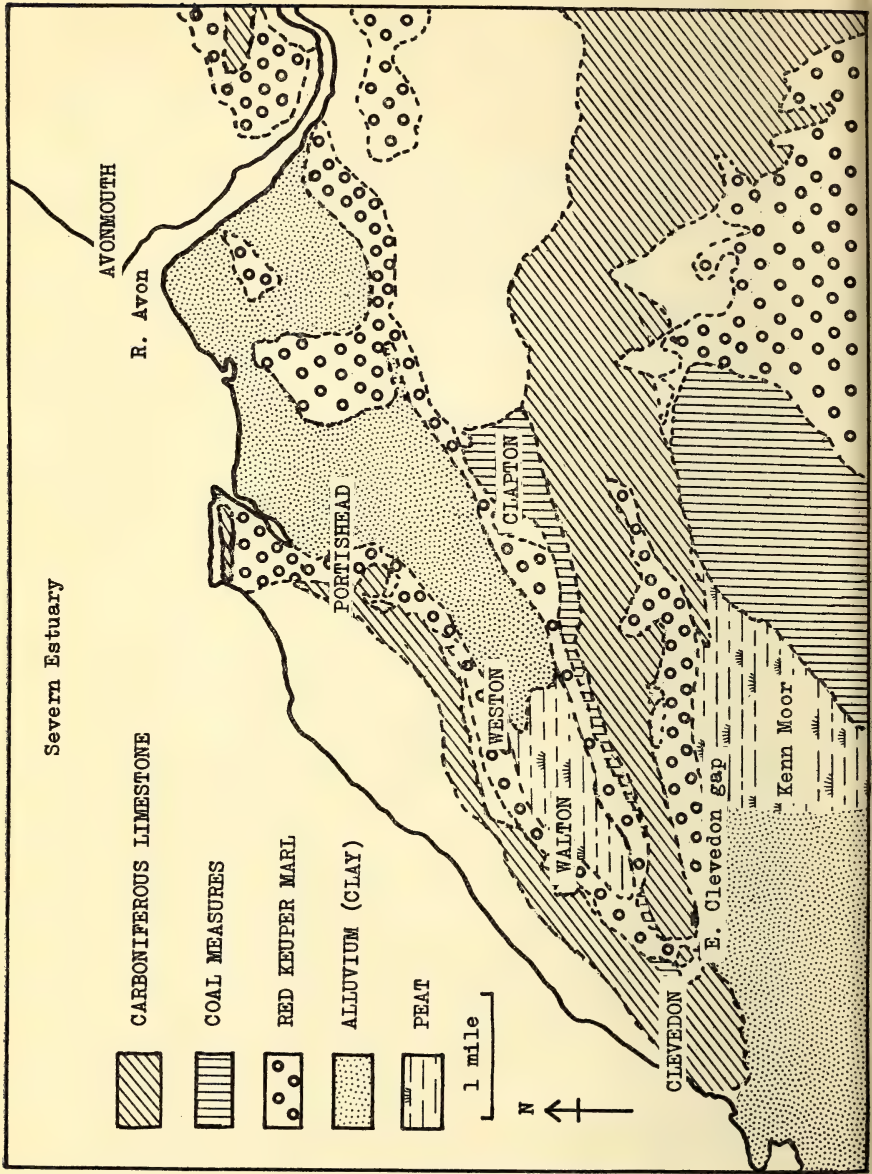
Severn Estuary
AVONMOUTH
R. Avon
PORTISHEAD
CLAPTON
WESTON
WALTON
CLEVEDON
E. Clevedon gap
Kenn Moor
CARBONIFEROUS LIMESTONE
COAL MEASURES
RED KEUPER MARL
ALLUVIUM (CLAY)
PEAT
1 mile
N

FIG. 2. *Geology of the Gordano Valley*
Only the chief geological features are shown in this simplified map.

probably Late-glacial in age, although the main peat-building phase in the valley did not begin until the Atlantic period of the Post-glacial sequence. The clay to the east of Weston Drove was deposited during the Romano-British marine transgression. Alluvium of this nature has been recognised in coastal areas of the Somerset Levels, including Kenn Moor, and in many other coastal regions of Britain (Godwin, 1943).

DRAINAGE SYSTEM OF THE VALLEY

A number of small streams and springs flow into the valley from the surrounding hill ridges. Walton Brook (Fig. 1) carries some of the drainage water from the northern ridge. In the floor of the valley there is a complex network of rhines, mainly dug at the beginning of the nineteenth century (Wigan), but at the west end three main drainage channels are evident, one on each side of the valley and one in the centre. Further east these large rhines converge and enter a single main channel which flows into Portishead Dock. Provision for deepening and straightening this channel was made in the Weston Drainage Act of 1815, and now the outlet is controlled by sluice gates. Prior to 1815 extensive flooding of the valley sometimes occurred ; there is a record of water from the Severn being allowed in at the old tide mill near Portishead (Wigan).

Many of the ditches in the central area of the valley are now blocked with vegetation and consequently the drainage is impeded. Indeed as there is little change in the level of the valley the drainage tends to be sluggish even under normal conditions, and unless the ditches are kept cleared they quickly become choked and fail to function. In several of the rhines the direction of flow is towards the head of the valley for some distance before junction with a larger channel flowing seaward is made. Between Clapton Lane and Walton Drove, a distance of nearly 3 miles, the drop in water level in the main drainage channels averages only about 2 ft. 6 inches.

The distribution of the vegetation of the valley is strongly influenced by the drainage pattern of the area. In view of their importance, water levels were measured at selected sites over a period of about a year, and readings of rainfall were also taken.

RAINFALL

A simple rain gauge consisting of a funnel (4 inches diam.) and receiving vessel was fixed in an open site in a field (17 ft. O.D.) adjoining Walton Drove (Fig. 1). Readings of precipitation were taken weekly from October 1956 to May 1958 ; some of these values are plotted in Fig. 3. Comparison of the readings with those for

Long Ashton Research Station (162 ft. O.D.), near Bristol, and for Clarence Park (28 ft. O.D.), Weston-super-Mare, showed that there was a general agreement in the rainfall figures for all these sites. The differences are largely attributable to differences in topography and altitude ; it is of note that some of the biggest variations occurred during the summer months when thunderstorms were prevalent. Over the period for which a comparison can be made (October 29th, 1956–May 25th, 1958) the total rainfall recorded at Long Ashton was 53.1 inches, at Weston-super-Mare was 44.2 inches and for the Gordano valley was 47.9 inches. The amount of rainfall recorded for the Gordano valley is clearly intermediate between that for Weston-super-Mare and for Long Ashton, as might be expected from its position between these two stations and the general distribution of rainfall in N. Somerset (Hannell, 1955).

WATER LEVELS IN THE VALLEY

Records of water level at various chosen points in drainage ditches and in holes dug in the peat were made periodically throughout the year. The water level was measured at each site by reference to a fixed marker at a known height. At many of the sites the water-table was at its highest in February 1957, after heavy rainfall in December and January, and at its lowest in June 1957 after little rain in April and May.

There is a clear relation between rainfall and water level both in the drainage channels and in the peat, a fall in rainfall being fairly quickly followed by a corresponding fall in water level (Fig. 3). In the rhines the range between the maximum and minimum levels is fairly small, a reflection of the smallness of the catchment area (*c.* 6 sq. miles from the head of the valley to Clapton Lane) which the drainage system serves. In the main drainage channel, where there is greatest down-cutting of the floor, the range is widest, and the rise in level after rainfall is shown most quickly. These quicker and greater changes in level reflect the larger size of the catchment area served by the main channel ; in addition, drainage from the clay surface at the east end of the valley is quicker than drainage through the peat at the west end, the slow percolation of the water here leading to delayed maxima.

The variation of water level in the peat is, however, larger than that in the drainage channels, the greatest differences being noted in a site in *Salix* carr, far from large rhines (Fig. 3, Site I). This site was flooded during the winter, whereas during the summer the water table was nearly a yard below the surface. Drainage into and out of this area is slow and the low level of the water-table in summer

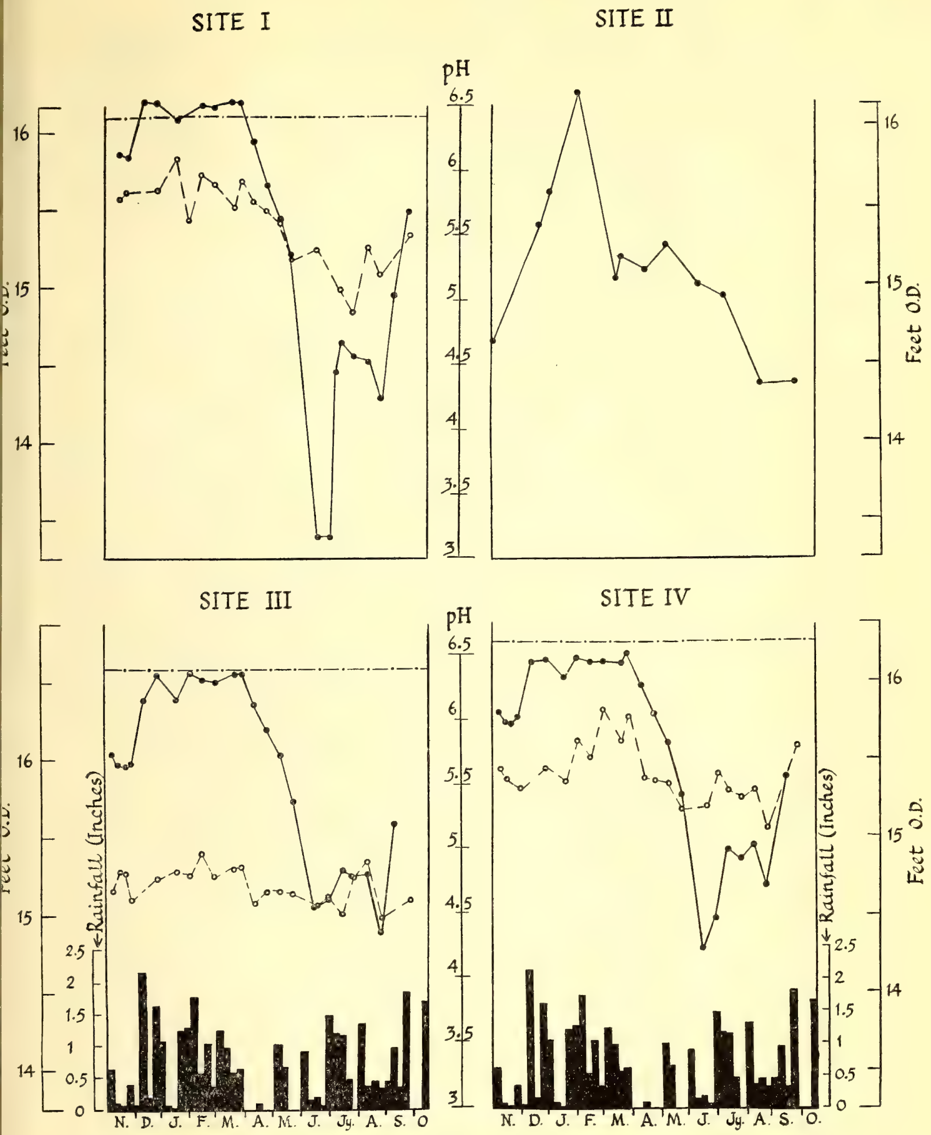

Fig. 3. *The relationship between rainfall, water level and pH.*

Data are presented for Nov. 1956—Oct. 1957, weekly amounts of rainfall being shown in histogram form at the bottom of the figure. Ground level is indicated by –·–·–·, pH by O– –O and water level by ●——●. The positions of the four sites are given in Fig. 1. Site I is in *Salix* carr, Site II in a large rhine east of Weston Drove, and Sites III and IV in one of the central enclosures of the valley. The high level of water in the rhine (Site II) in February after a period of heavy rainfall is shown. In winter the water table in the peat (Sites I, III and IV) was at or near the surface but fell to a low level in June after low rainfall in April—June. Variations in pH are greatest where flooding occurs (Site I).

seems largely a result of the transpiration losses from the trees and bushes (chiefly *Salix atrocinerea*) during a period of low rainfall.

The valley has not been extensively flooded for a number of years, although in many of the peaty areas the water table during the winter is only a few inches below the surface (Fig. 3, Sites III and IV). The two ditches bordering the valley are capable of taking a considerable amount of the hill drainage water, and flooding of the central parts of the valley rarely, if ever, occurs.

VARIATION OF pH

In view of the important influence of the hydrogen-ion concentration of the drainage water and of the soil water on the vegetation, measurements of pH were made periodically. Samples of water were taken from many of the drainage ditches, and, in selected sites, samples of peat were collected from just below the surface. The peat samples were extracted with an equal volume of distilled water, and pH measurements were made at a glass electrode.

The drainage water in nearly all of the rhines is about neutral. The water of Walton Brook, draining from the Carboniferous Limestone ridge above Walton-in-Gordano, was consistently alkaline in reaction, varying from pH 7.4 to 8.3 at different times of the year. Measurements from many of the rhines in the floor of the valley ranged from pH 6.5 to 7.3. Only one stream carrying water which was consistently somewhat acidic (pH 5.7 to 6.9) is known to enter the valley. This stream lies to the west of Clapton-in-Gordano and flows from the Coal Measure rocks.

The water held in the surface layers of the peat varies in pH from about 4.5 to 7.2. At most of the sites studied, variation in pH at the same site at different times of the year is fairly small (± 0.5 pH unit), but there are large variations from site to site. In the central parts of the valley, far from drainage channels, and not subject to flooding, the pH values often lie between 4.5 and 5.0 throughout the year (Fig. 3, Site III). However, at the extreme west end of the valley, and near the sides, the soil water is neutral or even slightly alkaline in reaction. Even in the central area, the water held by the peat immediately adjoining the drainage ditches is about neutral, but there is a fairly marked uniform pH gradient away from the ditches, conditions becoming more and more acidic the further from the drainage channels. At the sites fairly near the rhines the largest pH variations are found (Fig. 3, Sites I and IV), since the soil water tends to become acidic in summer, but in winter, being near the ditches, the sites may be flooded with calcareous water draining from the surrounding hills. Base-rich drainage water is, however, largely confined to the rhines, extensive flooding being rare, as indicated above ; moreover, the acidic peat in the centre of the moor is fairly well buffered, and penetration of small quantities of calcareous water does not lead to a large change in pH. However, although the pH in the surface layers of the peat away from ditches may be about 4.5, conditions are less acid in the deeper layers. In one such site samples at the surface gave a pH of 4.8, and at a depth of 1 metre of 6.5, there being a gradual change down the profile.

MINERAL CONTENT OF THE DRAINAGE WATER AND PEAT

As much of the water entering the valley is derived from rainfall on the surrounding hill ridges which are composed mainly of Carboniferous Limestone, the water is likely to be fairly calcareous. An attempt was made to gain rough estimates of the content of calcium and other minerals in the water of the rhines, since the base status of the water has important influences on the vegetation (Tansley, 1949 ; Pearsall, 1950). Estimates of the levels of calcium, magnesium, potassium and iron in the water were made, by the methods described by Morgan (1941), at various sites.

In all the drainage ditches the water was found to have a moderately high calcium content, usually between 0.01–0.005N (10–5 m. eq./l.). Figures for magnesium were 0.001–0.0005N (1–0.5 m. eq./l.), for iron were 0.0003N (0.3 m.eq./l.) and for potassium 0.0005N (0.5 m.eq./l.) or less. It may be concluded that the water was of fairly high base-status, and it is of interest that the drainage water from the peat moor at Sharpham on the Somerset Levels, where the vegetation is of " mixed fen ", gave fairly similar analyses.

In many parts of the valley the peat was also of high base status. A series of samples of surface peats taken for analysis gave values of ash content, expressed as a percentage of the dry weight, ranging from about 20% to 30%. It is probable that some of these high values arise from the addition of cinders to the surface of the peat in some parts. However, the ash content of the peat throughout a profile from a depth of 1 foot to 9 feet was between 10% and 12%. These figures are in striking contrast to those for bog or *Sphagnum* peat ; a sample of the latter from near Shapwick, Somerset, gave an ash content of 1.0%, and the peat from the Callunetum of Thornton Mire, Yorks, an ash content averaging 3.7% (Harley and Yemm, 1942). It seems likely that the high values of the ash content of the surface peat at Gordano may partly result from wastage of the peat as a consequence of the lowering of the water table by artificial drainage.

From the above results it is clear that base-rich water enters the valley, and drains through the network of rhines. Conditions of high mineral supply and a high water table therefore prevail throughout much of the area, and have led to the development of fen vegetation. Only in parts far from the rhines is there a tendency for the vegetation to depend to an appreciable extent on direct rainfall for its water supply, and for acid conditions to arise as a result of the decay of plant material. However, even here the water is doubtless too rich in minerals and the climate not sufficiently wet for raised bog to develop.

THE VEGETATION OF THE VALLEY

The natural vegetation of the wet, peaty areas is that of fen, a variety of communities of eutrophic plants being present. In some parts conditions tend to be acidic and the calcium content of the soil water lower, and here plants such as *Eriophorum angustifolium* occur. Much of the valley has, however, been brought under cultivation at some time, and human influences must have affected the vegetation considerably. White (1912, p. 15) records that peat has here been " dug for fuel within my recollection " ; there is, however, no evidence of peat-cutting on an appreciable scale. In the drier areas at the sides of the valley many of the enclosures are mown and grazed and several have been limed. Some of the peat land in the centre of the valley has been ploughed in the past (plough lines are visible in aerial photographs, taken in 1946, in areas now vegetated) ; according to local information a number of enclosures were ploughed during the 1914–18 war. Recently some of this land, dominated by the purple moor-grass, *Molinia caerulea*, has again been brought under the plough. As already mentioned, cinders have been scattered over certain areas of the peat ; in some places a fairly thick layer can be distinguished, and in others the cinders are sparser and now intimately mixed with the top few inches of the peat.

Studies of the vegetation in many sites in the valley were made on a quantitative basis, in order that the chief communities could be recognised, and their composition assessed. For this purpose, frames of 12 inches × 6 inches were employed ; they were thrown at random in the various areas and the plants within the frame listed, and their relative bulk (volume) scored subjectively out of a total of 10, an allowance being made for bare ground on an area basis. Where the bulk for a species was less than 1, it was scored as a trace, and arbitrarily 10 traces were taken as equalling 1. The method of scoring is the same as that described by Willis *et al.* (1959). In any one area 15 frames were thrown and the results averaged and expressed on a percentage basis.

In Table 1 the composition of the vegetation in nine areas is

TABLE 1. The composition of the chief plant communities. For explanation see text (pp. 478-80).

	Fen meadows			*Semi-natural fen*		*Molinietum*		*Salix carr*	*Pasture on clay*
Site	A	B	C	D	E	F	G	H	I
Bare ground	1	9	.	.	.	.	+	7	1
Agrostis canina	24	4	5	4	7	2	18	29	14
Holcus lanatus	54	5	9	2	+	+	7	36	13
Carex panicea	2	18	23	30	34	5	.	3	7
Carex nigra	+	5	33	.	37	.	25	.	.
Juncus subnodulosus	.	1	3	12	+	.	.	.	.
Centaurea nigra	.	.	+	19	1	13	.	.	1
Filipendula ulmaria	.	+	2	11	.	+	.	.	.
Molinia caerulea	.	.	+	.	.	76	40	.	.
Lolium perenne	8	.	.	.	.	.	.	.	16
Juncus articulatus	.	13	.	.	.	.	.	.	5
Eleocharis palustris	.	11	.	.	.	.	.	.	.
Juncus effusus	.	.	.	.	.	.	.	11	.
Anthoxanthum odoratum	.	6	10	.	.	.	1	+	.
Cirsium palustre	.	.	3	3	4	+	+	2	3
Juncus conglomeratus	3	.	3	+	1	+	+	.	.
Carex demissa	+	3	+	.	1	.	.	.	2
Galium palustre	.	+	+	+	+	+	+	+	.
Lotus uliginosus	.	+	+	+	3	+	+	+	1
Plantago lanceolata	.	1	+	1	.	.	+	.	4
Potentilla erecta	.	+	+	1	1	+	1	.	.
Sieglingia decumbens	.	+	1	+	+	.	+	.	+
Angelica sylvestris	.	.	.	2	1	+	2	2	.
Ranunculus acris	+	+	1	.	.	+	.	+	3
Mentha aquatica	.	+	1	+	3	+	.	2	.
Cirsium dissectum	.	.	2	.	+	+	+	.	1
Ranunculus flammula	.	+	+	.	.	+	.	+	.
Hydrocotyle vulgaris	.	.	.	.	2	2	1	.	.
Acrocladium cuspidatum	+	1	.	.	+	.	.	+	.
Taraxacum officinale agg. Taraxacum paludosum agg.	.	+	+	.	+	.	.	.	2
Glyceria fluitans	2	+	.	.	.	.	.	+	.
Ajuga reptans	+	+	.	.	.	+	+	.	.
Lythrum salicaria	.	+	.	+	+	.	.	.	.
Luzula multiflora	.	.	+	.	+	.	1	.	.
Equisetum arvense	.	.	+	+	+	.	.	.	.
Festuca pratensis	3	.	.	.	.	.	.	.	2
Cynosurus cristatus	+	.	.	.	.	.	.	.	2
Festuca rubra	.	1	.	1	.	.	.	.	.
Trifolium repens	1	.	.	.	.	.	.	.	4
Phragmites communis	.	3	.	.	2	.	.	.	.
Juncus inflexus	.	8	.	.	.	.	.	.	1
Leontodon leysseri	.	2	.	.	.	.	.	.	4
Carex hostiana	.	7	.	.	.	.	.	.	.
Prunella vulgaris	.	+	.	.	.	.	.	.	2
Eupatorium cannabinum	.	.	.	6	.	.	.	.	.
Carex distans	.	.	.	4	.	.	.	.	.
Solanum dulcamara	.	.	.	.	.	.	.	5	.
Other species	1	1	1	2	2	1	1	2	12

listed. These areas have been selected from a much larger number where vegetation records were made, as best representing the main types of community in the valley. The positions of the sites A–I are given in Fig. 1, from which it can be seen that nearly all of the areas listed are at about 16–17 ft. O.D. (area I is approximately 2 ft. higher). Where the contribution to the total bulk of the vegetation by any one species is less than 0.5 %, this is shown in the table by +. The records were made in July 1957. Nomenclature follows that of Clapham, Tutin and Warburg (1952).

Apart from the aquatic vegetation of the rhines, there are five chief types of community which may be recognised, although many intermediates can be found. The main types are as follows :

1. Fen meadows
2. Semi-natural fen
3. Molinietum
4. Carr
5. Pasture on clay

The first four types of vegetation are developed on the peat, the fen meadows being subject to grazing and mowing, whereas the semi-natural fen areas are only little affected by human influences. However, some areas previously used for agriculture are reverting to semi-natural vegetation, and others, previously unexploited, may be brought under agriculture so that no sharp boundary between the types can be drawn. Near the junction of Walton and Weston Moors a community dominated by *Molinia* has developed, and in several areas *Salix* carr is present. In some of the communities included here as semi-natural fen, there is some indication that progression to carr is possible.

The chief types of vegetation are described in turn, but no attempt is made here to list the plants of the various communities exhaustively.

1. Fen Meadows

The fen meadows are situated at the margin of the valley and at the west end. As already mentioned, moist, base-rich conditions prevail and many of the plants occurring are characteristic of eutrophic vegetation. In some parts of the valley where the meadows are more acid in their soil reaction there is a change in the flora and some species which tend to be oligotrophic are also present.

In the fen meadows agricultural practices have a large influence on the composition of the communities. In some fields grasses make up a high percentage of the total vegetation (Table 1, A). *Agrostis canina*, *Holcus lanatus*, *Festuca pratensis*, *Lolium perenne* and *Cynosurus* *cristatus* are often abundant while *Alopecurus geniculatus* and *Bromus mollis* sometimes occur here but are unrepresented elsewhere in the peat flora of the valley. Correspondingly the low values in site A for the Carices and the relatively sparse number of other species in comparison with other fen meadow sites is interesting. At various time intervals these fields are sprayed with selective weed-killers and regular spraying has been continuous for two years. Observations showed that *Carex hostiana*, *C. panicea*, *Equisetum palustre*, *Lychnis flos-cuculi* and *Senecio aquaticus* × *jacobaea* were adversely affected by this treatment, and there was a tendency for an increase of plants which are unaffected, such as the grasses.

In other fields where grazing is heavy, but weed-killers are not applied, a characteristic flora has developed. Many of the plants are small and tufted, such as *Isolepis setacea*, *Carex demissa* and *Juncus articulatus* (Table I, site B). These plants appear to be able to withstand trampling, often colonising the hoof marks made in the peat. *Juncus bufonius* is especially prevalent in this situation. In one enclosure *Eleocharis uniglumis* is found.

The effect of grazing on the larger Junci is striking. Both *J. conglomeratus* and *J. subnodulosus* are eaten by cattle whereas the tougher *J. inflexus* is avoided and is plentiful in some damp pasture sites. Also grazed is *J. effusus* var. *compactus* which is fairly abundant in one area. Where *Juncus* tussocks are degenerating, *Holcus lanatus* invades the centre of the decayed tussock. Its good growth here may depend on the protection from grazing afforded by the remains of the tussock or the relatively drier situation in the raised tussock. Certainly during dry years *Holcus lanatus* and *Anthoxanthum odoratum* appear to be more abundant in the valley than during wet years. These fen fields contain some typical eutrophic species which withstand the effects of cattle grazing and trampling. Such plants include *Carex panicea*, *Juncus subnodulosus*, *Filipendula ulmaria*, *Anagallis tenella* and *Samolus valerandi*. The last two plants have not been found elsewhere in the valley and are probably excluded from the semi-natural fen areas because of the tall vigorous growth of the herbage.

Some fields to the north of the central area have a lower pH than the typical base-rich fen meadows of the valley and the flora is somewhat different (Table I, C). Sedges (*Carex nigra* and *C. panicea*) may constitute a high proportion of the vegetation, and some species occur (*Carex echinata*, *Potentilla erecta*) which are more usually associated with oligotrophic communities.

In addition to the plants listed in Table I, or mentioned above, the following were recorded in the frames :

SITE A	SITE B	SITE C
Carex hirta	Bellis perennis	Agrostis stolonifera
Potentilla anserina	Briza media	Briza media
	Cerastium vulgatum	Carex pulicaris
	Senecio aquaticus x jacobaea	Rumex acetosa
	Trifolium pratense	Amblystegium serpens
		Brachythecium rutabulum

Near the banks of one of the rhines bordering fen meadows in Walton Moor, *Cyperus fuscus* still persists, although apparently in very small quantity. When this plant was first discovered in the valley by S. J. Coley in 1900, it was reported to occur in great abundance along two rhines, extending along them quite a mile (Bucknall, Fry and White, 1901). There was a luxuriant crop also in August 1921 (White, 1922). Doubtless the plant has suffered considerably from ditch clearance since then. It now grows chiefly on the peat removed from the rhines and piled on their banks, and is often associated with *Isolepis cernua* (locally plentiful), *Juncus bufonius* and *J. articulatus*, together with larger plants often colonising the banks of rhines, such as *Mentha aquatica*, *Veronica beccabunga*, *Myosotis palustris* ssp. *palustris*, *Cirsium palustre*, *Nasturtium officinale*, *Triglochin palustris*, *Polygonum persicaria* and *P. hydropiper*. Along ditches of two of the fen meadows on the north side of the valley *Veronica scutellata* is found.

Senecio jacobaea grows on the drier, higher parts of several of the grazed fen meadows. With *S. aquaticus*, present in the wetter areas, it has given rise to a hybrid population, many of the plants showing characters of leaf, inflorescence, involucre and cypsela intermediate between those of the species. The hybrids are plentiful in a number of the fields.

2. Semi-natural Fen

These semi-natural areas contain a typical eutrophic fen vegetation although in places where the pH is lower there is a tendency towards a more oligotrophic community, as in the fen meadows. Plants such as *Centaurea nigra*, *Carex panicea*, *Angelica sylvestris*, *Filipendula ulmaria*, *Eupatorium cannabinum* and *Juncus subnodulosus* are plentiful (Table 1, D), and in one area *Thalictrum flavum* is present as an isolated colony. There is a succession in the flowering of these showy, tall, herbaceous fen plants beginning with *Cirsium dissectum* in late spring. Rather less frequently encountered in the semi-natural fen vegetation of the valley, but present in one or more sites, are *Carex hostiana*, *Galium uliginosum*, *Hypericum tetrapterum*, *Iris pseudacorus*, *Orchis praetermissa*, *Platanthera bifolia*, *Scutellaria galericulata*, *Stachys palustris*, *Succisa pratensis*, *Valeriana dioica*, *V. officinalis*, *Vicia cracca* and *Dryopteris spinulosa*. *Carex elata*, although destroyed in one area of Weston Moor by raising and levelling of the ground, has recently been found in another locality nearby (Sandwith and Sandwith, 1957). The Royal fern, *Osmunda regalis*, now extinct in the valley (White, 1912), was very probably once a member of the semi-natural fen vegetation. The absence of the small, tufted species in the fen meadows is most noticeable ; they are probably excluded as a result of competition with the thickly-growing, taller plants.

In the more acid places, *Agrostis canina*, *Carex echinata* and *C. nigra* are present (Table 1, E). These plants are mainly situated in the centres of the fields and not around the edges where a eutrophic community is found, and calcareous water from the ditches penetrates the peat. Where *Carex echinata* and *C. nigra* grow there is a decrease in characteristic eutrophic species, such as *Filipendula ulmaria*, *Carex panicea* and *Juncus subnodulosus*. Other plants, usually indicative of acid conditions, which occur in the valley are *Juncus acutiflorus*, *Carex ovalis* and *Eriophorum vaginatum*, the latter represented by only a single tuft in Weston Moor (Sandwith and Sandwith, 1957). In some areas of semi-natural fen, *Agrostis canina* var. *canina*, *Carex disticha* and *C. nigra* dominate almost completely, forming fairly pure stands. Where small depressions occur in the peat surface, *Juncus conglomeratus*, *Hydrocotyle vulgaris* and *Mentha aquatica* are frequent, and are perhaps favoured by the damper conditions.

As well as the plants given in Table 1, and mentioned above, the following were present in the frames :

SITE D	SITE E
Carex flacca	Achillea ptarmica
Carex pulicaris	Carex flacca
Brachythecium rutabulum	

The contrast in vegetation of a semi-natural fen area with that of a fen meadow may be illustrated by studies from two adjoining fields. The ground level and pH of the fields are very similar so that a direct comparison can be made. The species listed for each field are those which are rare or absent in the other field.

Semi-natural fen field	*Grazed fen meadow field*
Centaurea nigra	Ajuga reptans
Eupatorium cannabinum	Carex demissa
Filipendula ulmaria	Cerastium vulgatum
Luzula multiflora	Juncus articulatus
Molinia caerulea	Juncus bufonius
Plantago lanceolata	Potentilla anserina
	Ranunculus acris
	Trifolium dubium
	Trifolium pratense

The absence of the tall herbaceous fen plants in the grazed fen meadow is striking, whereas here low-growing tufted and creeping plants thrive which are excluded from the semi-natural fen vegetation.

3. Molinietum*

In the central region of the valley, where acid conditions prevail, *Molinia caerulea* is dominant over a considerable area. The pH of the soil where this grass is found varies from about 4.1 to 6.3, but where this plant is flourishing the soil reaction is usually more acid than pH 5.5. The less acid sites are occasionally flooded by calcareous water.

The tussocks of *Molinia* are fairly uniform in height (55–70 cm.) and are of a large size. Where the grass dominates, the raised tussocks are rarely, if ever, flooded, although in the winter the water table is near the surface of the peat. The occurrence of *Molinia* in these areas is in keeping with the observations of Jefferies (1915) that the plant succeeds under conditions of mild acidity where the water does not stagnate.

The vegetation of a site where *Molinia* is a clear dominant is given in Table 1, F, and where it is accompanied by a fairly high proportion of other plants in Table 1, G. The latter site, recently used for rough grazing, has probably been much influenced by ploughing in the past, and the *Molinia* appears to have invaded the area from the surrounding fields.

The number of species associated with *Molinia* is fairly small in comparison with those of other communities developed on the peat. An important factor here may be the large amount of litter produced by the slow decay of the tussocks. Frequently the degenerating tussocks are colonised by *Holcus lanatus* and *Carex nigra*. As well as these species, *Agrostis canina*, *Potentilla erecta*, *Luzula multiflora* and *Eriophorum angustifolium* are fairly common in Molinietum. Bryophytes are not plentiful; *Brachythecium rutabulum* occurs and the liverwort *Calypogeia fissa* was found in site F and also in site G where it was growing with *Lophocolea bidentata*. Other plants of these two sites, not listed in Table 1, are *Achillea ptarmica*, *Equisetum palustre*, *Carex disticha* and *Rumex acetosa*.

Towards the ditches *Molinia* becomes sparser. In these areas which are more nearly neutral, and more subject to flooding, tall fen plants such as *Filipendula ulmaria* and the eutrophic *Juncus subnodulosus* form a somewhat mixed community.

The Molinietum is of particular interest with regard to the succession of natural communities in the valley. Study of the plant

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*Since this paper was prepared much of the Molinietum area has been considerably altered; many of the *Molinia* tussocks have been cleared to make the land useful agriculturally.

remains in the thick peat of Walton and Weston Moors indicates that at no time in the past was there a phase of raised bog development ; in this feature the Gordano valley differs from a number of areas of the Somerset Levels which have been investigated (Godwin, 1943 ; Clapham and Godwin, 1948). Molinietum is well known as a stage in the hydrosere (Tansley, 1949), succeeding reedswamp or fen vegetation and often giving way finally to raised bog in which *Sphagnum* is frequently an important component. At Gordano the succession to Molinietum is limited to the central, more acid parts of the valley, and progression to raised bog does not take place, as indicated earlier, probably because the precipitation is too low and the incoming water is too calcareous, none of the peat surface being sufficiently elevated to be completely out of its influence. Both *Sphagnum* sp. and *Aulacomnium palustre* have been reported for the valley (Davies, 1956), but it has not been possible to confirm these records. Certainly in no area has vegetation typical of a raised bog been encountered.

4. Carr

A relatively small area of the valley is occupied by well-developed carr. Most of it appears to be of fairly recent origin, but remains in the peat indicate that in the past alder carr was probably extensive, especially at the margins of the valley. Near Walton Drove there are now plantations of poplars and of pines.

Two strips of carr in an area of semi-natural vegetation are composed almost entirely of *Salix atrocinerea*, which is capable of regenerating itself fairly freely. In winter the peat of these areas becomes very waterlogged, but in summer the water table is low compared with that in other parts of the valley (Fig. 3, Site I). In sites where there is no graizng (Table 1, H), the ground flora is fairly rich and contains a number of species in common with the carr of Wicken Fen (Tansley, 1949). The ground flora of grazed areas in the *Salix* carr shows several differences ; it is dominated by *Agrostis canina*, has fewer of the tall herbaceous fen plants and often a fairly high proportion of the peat surface is bare. Ferns are uncommon here, as elsewhere in the valley ; *Athyrium filix-femina* and *Dryopteris filix-mas* are present in small quantity. Towards the edges of the carr, where it merges with the semi-natural fen vegetation, plants such as *Mentha aquatica*, *Eriophorum angustifolium*, *Juncus subnodulosus* and *J. conglomeratus* are frequent where the water table is high.

In one part of Walton Moor there is a fairly open stretch of carr, a variety of woody plants occurring. *Betula pubescens* is abundant ;

Salix atrocinerea is also fairly plentiful. Less common are *Alnus glutinosa*, *Quercus robur*, *Frangula alnus*, *Salix caprea*, *Crataegus monogyna*, *Fraxinus excelsior* and *Viburnum opulus*. In some parts of the carr *Lonicera periclymenum* occurs and Rubi locally form a fairly dense undergrowth ; present are *Rubus fruticosus* L., including the rate *R. sulcatus* Vest which was recorded for Walton Moor in 1918 by Miss Roper (White, 1920), and *R. caesius*.

Much of the area now dominated by herbaceous fen plants appears to be at a level where the development of carr is possible. The critical level for shrub establishment is approximately that of the winter water table (Godwin and Bharucha, 1932) ; it has already been shown that much of the peat surface is above normal flood limits. However, the effects of occasional grazing in the valley may be sufficient to prevent extensive carr development ; it is of note that bushes of *Salix atrocinerea*, *Crataegus monogyna* and of other shrubs are sparsely scattered throughout areas dominated by herbaceous plants. Carr development is also much retarded by burning ; small fires are not uncommon in the dry vegetation and seem to affect the shrubs more adversely than many of the herbaceous plants.

5. Pasture on Clay

East of Weston Drove, the peat is overlain by Romano-British alluvium. This marine blue-grey clay supports vegetation which is very different from that of the peat surface to the west. Nearly all this clay land is used for grazing or mowing, and grasses, chiefly *Agrostis canina*, *Holcus lanatus* and *Lolium perenne*, dominate.

The list for site I in Table 1 shows that many of the plants of the pasture developed on the clay are represented also in the peat flora. Growing on the clay, however, but apparently absent from the peat, are *Carex contigua*, *Luzula campestris*, *Hordeum secalinum* and *Serratula tinctoria*. On the other hand, many of the plants found on the peat, including tall herbaceous fen species and a number of the fen meadow plants, are absent on the clay. However, low-growing tufted, rosette and creeping forms are common here. As well as the plants mentioned above, and given in Table 1, the following were recorded at site I :

Achillea millefolium
Bellis perennis
Bromus mollis
Carex hirta
Cerastium vulgatum
Daucus carota
Equisetum palustre
Lathyrus pratensis
Lysimachia nummularia
Phleum pratense
Potentilla reptans
Pulicaria dysenterica
Senecio aquaticus x jacobaea
Succisa pratensis
Trifolium pratense

THE VEGETATION OF THE RHINES

A rich and varied flora, chiefly of eutrophic plants, is found in the extensive network of drainage ditches. The flow of water is never very fast, even under conditions of flood, and the rhines soon become choked with a dense growth of vegetation. Many of the ditches are cleared regularly, but recolonisation quickly takes place.

In ditches where water is flowing at a moderate rate, plants such as *Alisma plantago-aquatica*, *Sparganium ramosum* ssp. *ramosum*, *Glyceria fluitans*, *Juncus subnodulosus*, *Callitriche obtusangula* and *Phragmites communis* are common. *Phragmites*, and in some ditches *Phalaris arundinacea* and *Typha latifolia*, often form a dense stand, and retard water flow considerably. Vigorous growth of the rhizome of *Phragmites* is frequently seen where this plant is spreading into a cleared rhine ; it also extends some distance from the rhines into the enclosures, particularly in the rather low-lying areas. *Lemna minor* often forms a fairly complete mat on the water surface, and *Ranunculus trichophyllus* ssp. *drouetii* is plentiful in several of the rhines. *Baldellia ranunculoides*, *Ceratophyllum demersum*, *Elodea canadensis*, *Myriophyllum verticillatum*, *Potamogeton crispus*, *Sagittaria sagittifolia* and *Sparganium simplex* are present in one or more of the ditches. Also recorded for the rhines of Walton Moor are *Potamogeton coloratus* (White, 1912), *P. pusillus* (*panormitanus*) (White, 1925) and *Callitriche intermedia* (White, 1912) ; *Myriophyllum alterniflorum* and *Montia fontana* (White, 1912) are given for ditches below Weston-in-Gordano. *Ranunculus lingua* has been found on at least two occasions in the valley (White, 1918), but has not been recorded in recent years. Charophytes are fairly plentiful ; *Chara contraria*, *Tolypella glomerata* (White, 1923), *Chara delicatula* (White, 1926) and *C. vulgaris* var. *refracta* (Sandwith and Sandwith, 1958), as well as *C. aculeolata*, *C. globularis*, *C. hispida* and *C. vulgaris* var. *vulgaris*, are known or have been recorded for the rhines of the valley.

Where drainage is retarded by partial blocking, several plants in addition to those already mentioned are frequently found. *Carex pseudocyperus*, *Apium nodiflorum* and *Eleocharis palustris* are not uncommon, and in one rhine in Weston Moor *Eleogiton fluitans* is abundant. *Hippuris vulgaris* also grows nearby. Along the edges of some of the rhines *Myosoton aquaticum* occurs.

In certain areas of the valley the ditches have become almost completely blocked and silted up. Characteristic of these ditches is a flora including *Carex rostrata*, *C. acutiformis*, *C. pseudocyperus*, *C. remota* and *Juncus conglomeratus*. Also found in such sites are *Juncus effusus*, *Schoenoplectus tabernaemontani*, *Stellaria alsine* and *Nasturtium officinale*.

Many of the plants of the ditches, for example *Juncus subnodulosus*, typically occur where the mineral content is fairly high and where the reaction of the water is neutral or alkaline ; it is only in the centre of the valley, where the ditches are blocked to an appreciable extent and conditions may become slightly acidic, that plants tending to be somewhat oligotrophic, such as *Carex rostrata*, are found.

The small channels running across the fields on clay east of Weston Drove have a different vegetation from that of the rhines in the peat. Plants common in these ditches are *Caltha palustris*, *Cardamine pratensis*, *Carex acutiformis* and *C. otrubae*.

VEGETATION OF RUBBISH TIPS

Two areas of the valley, one in Walton Moor and one in Weston Moor, are used for the dumping of rubbish. The level is being raised considerably, the surface of the tips being some 6–8 feet higher that the original peat surface.

The semi-natural fen vegetation is buried and obliterated in these two areas, and many weed species are colonising the older parts of the dumps. No detailed study of the changing plant population of this artificial habitat has been made. Of the many plants now growing on the tips, *Cichorium intybus*, *Bromus* [*Anisantha*] *madritensis*, *Phalaris canariensis*, *Poa compressa* and *Vulpia myuros* may be mentioned. Several areas have been seeded and lucerne grown.

SUMMARY

The Gordano valley is a wedge-shaped, low-lying area with a very slight gradient. Drainage through the complex network of rhines is consequently rather sluggish. The water table is high and the fluctuation in level fairly small, changes in level being directly related to rainfall. The catchment area of the valley is not very great and extensive flooding of the low ground rarely occurs.

Deep fen peat is present in the floor of the valley, and west of Weston Drove peat is at the surface. East of Weston Drove, however, the peat is overlain by Romano-British marine clay.

Water entering the valley from the surrounding hill ridges of Carboniferous Limestone is alkaline, but in most of the rhines is about neutral in reaction although it is fairly calcareous. The high water table and calcareous water have resulted in the development of fen vegetation. At the head and margins of the valley much of the peat land is used for grazing, and many of the plants of the fen meadows are small and tufted, such as *Carex demissa*, *Juncus bufonius* and *J. articulatus*. Semi-natural fen vegetation occupies slightly lower ground, and here tall herbaceous plants, many of them well-known to be eutrophic, dominate. Among the most widespread are *Juncus subnodulosus*, *Carex panicea*, *Centaurea nigra*, *Angelica sylvestris*, *Filipendula ulmaria* and *Eupatorium cannabinum*. In the central parts of the valley, where conditions tend to become acidic, particularly away from the large rhines where the calcareous water does not readily penetrate, Molinietum has developed, and some plants (e.g. *Carex echinata*, *Eriophorum angustifolium*) which are usually members of oligotrophic communities occur. However, there are no signs that succession to raised bog is taking place. Carr, chiefly dominated by *Salix atrocinerea*, is not now as extensive in the valley as it was in the past, judging by remains in the peat which show alder to be abundant.

The rhines contain a varied and interesting flora ; where the water is flowing moderately, eutrophic aquatic plants are plentiful, but in the smaller ditches, which have become blocked, other plants, such as *Carex rostrata*, thrive.

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AN OCCURRENCE OF GALENA AT FLAX BOURTON

by LINDA CARLTON

IN the summer of 1956, a deposit of galena was found during operations at the new Stancombe Quarry, Flax Bourton (Hobbs Quarries Limited) (Grid Reference ST 505684). This is in the Clifton Down Limestone, which at this point is overlain by Trias marl.

There is in the Carboniferous Limestone here a series of parallel fissures, running East-West, mostly about one foot wide and infilled with calcite. Some also contain pink barytes in which are embedded small crystals of galena. However, one fissure which was exposed during 1957, across what was then the working face of the quarry, was about 3—4-ft. wide at the top, narrowing slightly with depth, and infilled with iron-rich clay which contained very contorted mineral veins consisting of bands of barytes with small galena crystals and calcite, both stained with iron oxides. There were also appreciable quantities of manganese oxides. Behind (i.e. to the South of) this clay seam was one of red quartz.

The main pocket of lead ore was in the line of the clay seam but beyond the eastern end of the quarry face, so that only the top of it has been seen. It extended downwards and to the South.

About a ton of high grade galena was removed from this pocket in lumps of up to 24-in. diameter. These were contaminated, usually on the outside, by barytes and were embedded, with bands of large calcite crystals, in clay. The site since has again been covered by rubble and has not so far been re-exposed.

Two large pieces of rock showing the mineralisation of the main vein are on show outside the quarry offices, and a fine specimen of the galena is in the City Museum. A map showing the quarry and the approximate positions of fissures and the pocket of galena is also in the Museum.

Analysis by gravimetric, colorimetric and spectrographic methods gave the following results :—

Galena from the pocket (5 samples)—

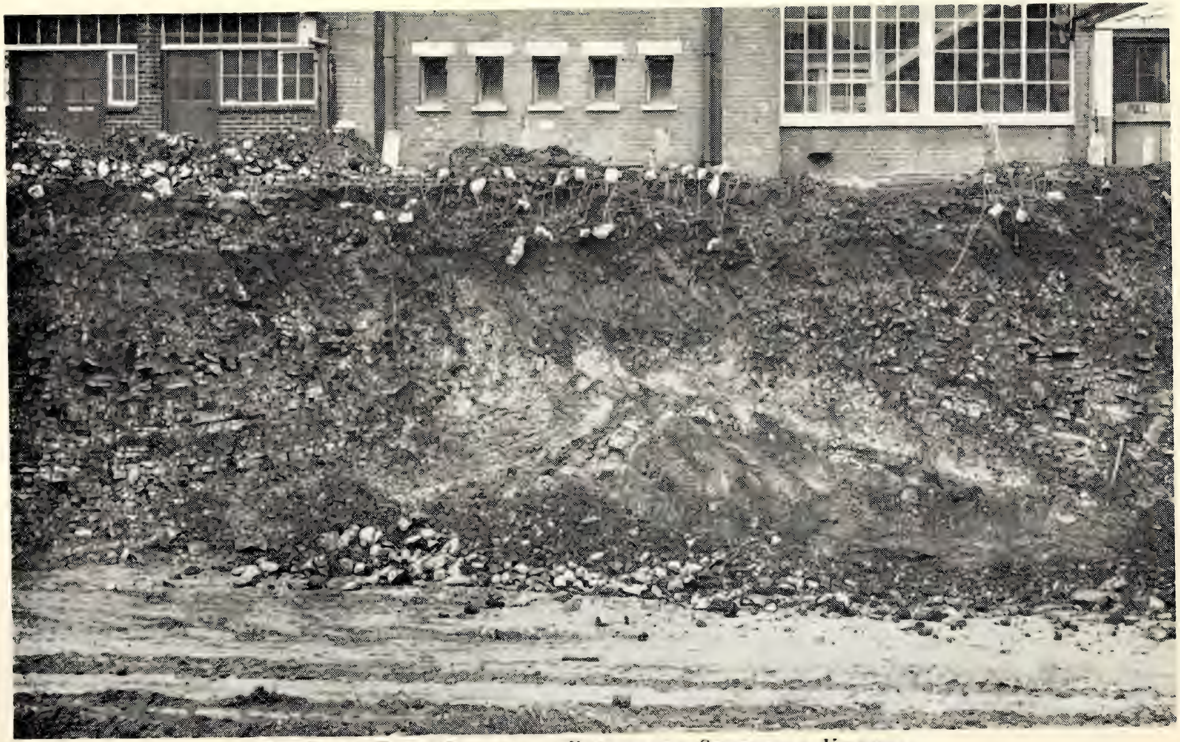
Antimony	ranging from	.2 to 7%
Silver	,, ,,	100 to 200 p.p.m.
Zinc	..	small crystals of blende irregularly distributed in the galena.

Galena from vein (small crystals) (One sample only)—

Antimony	less than .05%
Silver	40 p.p.m.

X-ray diffraction patterns of vein material taken with a Guinier focussing camera showed that lead sulphate, lead carbonate and silica (quartz) were present in minor quantities with the lead sulphide and barium sulphate.

I should like to express my thanks to Hobbs Quarries Limited for access to the site and for samples of galena, and to Shell Research Limited and the Bristol College of Technology, for laboratory facilities.



THE SOUTH-EAST WALL OF THE EXCAVATION, SOMERDALE, KEYNSHAM.

A TEMPORARY EXPOSURE OF RHAETIC AND LOWER LIAS AT FRY'S FACTORY, KEYNSHAM

By C. E. Leese, F. S. Ross and W. F. Vernon

In the summer of 1958 good sections were revealed in excavations for a new factory block at Somerdale. These showed the White Lias limestones to be arched up at three separate points above the blue clays containing the Cotham Marble. The structures did not appear to be linear in character, but rather cone-shaped, for they could be seen to be of limited lateral extent and could not be traced across the excavation. The main structure occurred on the south-east wall 150 ft. from its southern end, and an incipient one 150 ft. from its northern end. Near the middle of the south-west wall an upward curvature of the bed showed an arc of 4 ft. radius. It seems that the structure must be due to local disturbances produced by pressure adjustment in the mobile clays at the base of the succession. The largest of these structures, which affects the beds from the Cotham Marble to the Sun Bed and above (about 20 ft. thick) is illustrated in Plate II. Tutcher (1923) observed similar structures in the railway cutting a quarter of a mile to the south-west and one is illustrated in a plate accompanying his paper.

Possibly the phenomenon is the same as that referred to as valley-bulges and discussed by S. E. Hollingworth, J. H. Taylor and G. A. Kellaway (1944).

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At the end of Vol. IX publication in series ceased and the next volume, the twenty-seventh since publication started, is numbered XXVII.

Vol. XXVII. Pt. 1 (1944), Pt. 2 (1945), Pt. 3 (1946), Pt. 4 (1947), Pt. 5 (1948).
Vol. XXVIII. Pt. 1 (1949), Pt. 2 (1950), Pt. 3 (1951), Pt. 4 (1952), Pt. 5 (1953).
Vol. XXIX. Pt. 1 (1954), Pt. 2 (1955), Pt. 3 (1956), Pt. 4 (1957).

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